

Circular Visualization of Bilateral Internal Migration in India: A Focus on BIMARU States

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Abstract: This study rigorously analyses the trajectory of internal migration in India from 1991 to 2011 using the Census of India's D-02 Series data, uncovering key migration corridors and shifts. Through chord diagrams, the study visualizes migration flows, revealing the scale and direction of major inflows and outflows. Migration matrices further provide a detailed, decade-by-decade view of evolving patterns. Findings show Delhi and Maharashtra as major migration hubs, driven by economic opportunities. Delhi's migrants from Uttar Pradesh grew from 1.64 million in 1991 to 2.85 million by 2011, while inflows from Bihar rose from 0.26 million to 1.11 million. Similarly, Maharashtra's migrants from Uttar Pradesh increased from 1.01 million in 1991 to 2.75 million by 2011. Bihar's economic pressures spurred substantial out-migration to Delhi (from 0.52 million to 1.11 million) and to Jharkhand (1.34 million). Uttar Pradesh's outflows to Maharashtra and Delhi more than doubled over the period. Additional notable flows include 1.34 million migrants from Bihar to Jharkhand and 1.14 million from Rajasthan to Haryana. These trends underscore the economic forces behind migration and the pressing need for balanced regional development.

Key words: Bilateral Internal Migration, Migration Flows, Chord Diagrams, Regional Disparities, Migration Dynamics, India.

1 Introduction

Internal migration in India has been a defining feature of its demographic and socio-economic landscape for centuries. The movement of people from one place to another within the country is shaped by a multitude of characteristics including economic opportunities, environmental conditions and social dynamics [1]. Among the several patterns of internal migration bilateral migration flows like the movement between two specific regions are particularly perceptive for understanding the reasons behind population shifts and the regional imbalances in development. These flows explain how disparities in employment opportunities, development and living conditions drive individuals and families to migrate from their home states to other regions [2]. The issue of internal migration becomes even more serious when investiga-

tive the case of the BIMARU states like Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh (UP). Coined in the 1980s the acronym "BIMARU" emphasized the socio-economic underdevelopment in these states compared to the rest of India [3]. The word "BIMARU" itself carries the Hindi meaning of "sick" metaphorically demonstrating the poor economic and social health of these states. While the term is considered somewhat controversial and the situation in some of these states has enhanced over time the label continues to serve as a reminder of the rooted regional disparities in development [4].

India's vast size cultural diversity and economic structure contribute to a highly complex migration scenario. Internal migration incorporates the movement of people from one state, district or region to another within the country. According to

the Census of India 2011 more than 450 million people (about 37% of population) were classified as internal migrants moving primarily for reasons related to employment education marriage and other socio-economic factors [5]. A significant portion can be attributed to rural-to-urban migration, driven by the search for better livelihood opportunities [6]. Bilateral internal migration flows offer a detailed perspective on how specific states interact demographically both as migrant-sending and migrant-receiving regions. These flows not only reflect the regional inequalities in economic growth, but also the shifting population dynamics which can have far-reaching implications for urbanization labour markets infrastructure and governance [7]. The nature of these flows is multifaceted with some states being net receivers of migrants and others primarily being senders. States like Maharashtra Gujarat and the National Capital Territory (NCT) of Delhi have emerged as major destinations for migrants due to their relatively higher levels of economic development and industrialization. On the other hand, states like Uttar Pradesh, Bihar and Rajasthan despite having large populations have long been net exporters of migrants primarily due to high levels of underemployment, poverty and inadequate infrastructure [8-9]. Despite a substantial body of literature on internal migration in India existing studies have predominantly focused on migration determinants migration rates, labour mobility and socio-economic characteristics using household surveys or census-based aggregate statistics [1,10]. While these studies have significantly enhanced understanding of migration processes limited attention has been given to the bilateral spatial interaction of migration flows between states and their evolution over time. In particular, studies employing network-based visualisation techniques such as chord diagrams to examine the structure and intensity of inter-state migration corridors remain scarce. Moreover, the changing role of the BI-

MARU states as persistent labour-sending regions and their dynamic linkages with major destination states across multiple census periods have not been comprehensively investigated. Existing research also provides limited insights into how bilateral migration patterns reflect broader processes of regional inequality, spatial polarization and economic restructuring within India. Addressing these gaps, the present study examines bilateral inter-state migration flows using the Census of India D-02 data for 1991, 2001 and 2011. By integrating migration matrices with circular (chord) visualization the study captures the direction, magnitude and evolution of migration corridors over three decades. Unlike conventional descriptive analyses it provides a dynamic understanding of the changing migration network and identifies the persistent dominance of BI-MARU states as labour-exporting regions and economically advanced states as migration hubs. The findings contribute to the literature on internal migration by linking migration networks with regional development disparities and offer policy-relevant evidence for promoting balanced regional development and inclusive labour market planning. To the best of our knowledge this is one of the first studies to systematically analyse three decades of bilateral inter-state migration in India through migration matrices and chord-based network visualization offering a comprehensive assessment of the evolution of migration corridors and the spatial dynamics of labour mobility associated with the BI-MARU states.

Although numerous studies have examined internal migration in India using migration rates, socio-economic determinants, gravity models, or district- and state-level analyses, relatively little attention has been paid to the evolution of bilateral migration corridors over time. Existing studies primarily rely on tabular statistics, which provide limited insights into the complex network structure of inter-state migration. Furthermore, longitudinal comparisons of

bilateral migration flows across multiple Census rounds remain scarce. This study addresses these gaps by integrating migration matrices with circular (chord) visualization to analyse the evolution of inter-state migration networks over three decades (1991-2011). Unlike conventional descriptive approaches, chord diagrams simultaneously depict the magnitude, direction, and reciprocity of migration flows, enabling the identification of dominant migration corridors, regional connectivity, and changing migration hubs. By focusing on the BIMARU states within the national migration network, this study offers new evidence on how persistent regional disparities have shaped labour mobility and the spatial redistribution of population over time.

The novelty of this study lies in three aspects. First, it provides a longitudinal assessment of bilateral inter-state migration using comparable Census D-02 data for 1991, 2001, and 2011. Second, it applies circular (chord) visualization to reveal the structure, intensity, and evolution of migration corridors, an approach that has rarely been used in studies of internal migration in India. Third, it links migration networks with regional development disparities by examining the changing role of the BIMARU states as persistent labour-sending regions and economically advanced states as major migration destinations.

The present study focuses on the BIMARU states—Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh—because they have historically exhibited relatively low levels of industrialization, high population growth, persistent poverty, and limited employment opportunities compared with many other Indian states. These structural disadvantages have made them major sources of labour out-migration for several decades. Collectively, these states account for a substantial proportion of India's population and have consistently contributed large shares of interstate migrants seeking employment in economically ad-

vanced regions such as Delhi, Maharashtra, Gujarat, and Haryana. Examining migration from these states therefore provides important insights into the relationship between regional inequality, labour mobility, and economic transformation. Furthermore, analysing the evolution of migration corridors originating from the BIMARU states contributes to understanding whether long-standing spatial disparities have persisted or changed over the last three decades.

2 Research Objectives

The study is guided by the following objectives:

1. To examine bilateral inter-state migration patterns in India (1991–2011).
2. To visualize major migration corridors using migration matrices and chord diagrams.
3. To analyse the migration dynamics of the BIMARU states in relation to regional disparities.

3 Review of Literature

The phenomenon of internal migration in India particularly from the underdeveloped BIMARU states (Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh) has attracted considerable attention from scholars, development practitioners and policymakers. This section delivers a review of the key studies and literature on internal migration highlighting the socio-economic and demographic drivers the effects on sending and receiving regions and specific migration patterns related to the BIMARU states. Ravenstein's (1885) "Laws of Migration" laid the foundation for migration studies by categorizing factors into "push" (those compelling people to leave) and "pull" (those attracting migrants to a new location) forces [2]. In the Indian context this model has been widely used to explain the migration patterns

from the BIMARU states where push factors like poverty, agrarian distress, unemployment and inadequate social infrastructure drive migration [11-12]. Pull factors such as better economic opportunities, improved living conditions and higher wages in more developed states like Maharashtra, Delhi, and Gujarat further explain these migration trends [13]. Keshri and Bhagat (2010) found that poverty and lack of rural employment opportunities in Bihar and Uttar Pradesh were critical push factors, while pull factors included the concentration of manufacturing and service industries in cities like Delhi and Mumbai [14]. Their study also highlighted seasonal migration with migrants returning home for agricultural work during specific times of the year. Research has demonstrated that migration is closely linked to regional economic disparities with migrants typically moving from poorer less developed states to wealthier regions. Kundu and Sarangi argued that economic inequalities between regions particularly between rural and urban areas are a major determinant of internal migration flows in India [15]. According to their research, the BIMARU states exhibit low industrialization and poor urbanization levels, making them significant sources of out-migration. Migrants from these states often find low-wage jobs in cities exacerbating informal sector growth in urban centres. Kundu (2009) also noted that industrially backward states like Bihar and Uttar Pradesh have not been able to generate adequate employment opportunities for their large populations pushing their workforce to cities like Mumbai, Delhi, Ahmedabad, where construction services and informal industries thrive. The positive impact of remittances on source regions is a key area of interest in migration literature [16]. Stark and Lucas (1988) developed the New Economics of Labour Migration (NELM) model arguing that migration is not just an individual decision but a household strategy to diversify income and mitigate risks [17]. For the BIMARU states remittances sent

by migrants play a crucial role in alleviating poverty, improving household consumption and enabling investments in education and health [18]. In their study on Bihar, Kapur (2010) and Singh (2016) pointed out that remittances form a vital part of rural household income compensating for the lack of local employment opportunities [19-20]. The economic benefits, however are unevenly distributed as the poorest households often lack the resources to send members to distant cities relying instead on nearby migration opportunities that provide lower returns. Migration in India is also significantly gendered with marriage being the most common reason for female migration. Banerjee and Raju (2009) examined the case of women in rural Uttar Pradesh and Rajasthan, finding that gender norms and social practices heavily influence migration decisions [21]. Female migration is typically marriage-related, as women relocate to their husbands' households contributing to the spatial patterns of migration in these states [22]. Marriage migration from the BIMARU states is not just restricted to short-distance movements; many women migrate to distant urban centres as a consequence of rural-urban marriage patterns or spousal employment needs [13]. Mazumdar (2018) showed that while male migration is more economically motivated female migration trends are tied to socio-cultural factors. A significant portion of migration from the BIMARU states is circular or seasonal. Migrants often move temporarily to urban areas or industrial zones returning to their home villages during the agricultural season [23]. Deshingkar and Farrington (2009) emphasized that seasonal migration is a survival strategy for households in agrarian regions, especially in drought-prone states like Madhya Pradesh and Rajasthan [24]. Their study on seasonal migration found that migration from these states is driven by distress caused by agricultural failure debt and lack of local employment opportunities. Mosse et al. (2005) highlighted the

vulnerability of seasonal migrants noting that they often work in informal sectors with poor working conditions no job security and low wages. Their work found that seasonal migrants from Bihar and Uttar Pradesh in particular face exploitation in labour markets in states like Punjab, Gujarat and Maharashtra where they work as construction workers and agricultural labourers. The receiving states particularly Maharashtra Gujarat, and Delhi have witnessed rapid urbanization driven by the influx of migrants from the BIMARU states [25]. Breman (1996) argued that urbanization in cities like Mumbai and Delhi is fuelled by migrant labour which forms the backbone of industries like construction, informal services and textiles. However, this rapid urbanization also leads to challenges such as slums, urban sprawl pressure on infrastructure [26]. Harris (2013) explored how migrants from Bihar and Uttar Pradesh contribute to the informal labour market in Delhi. He found that while migrants are crucial to the city's economy, they often live in precarious conditions with limited access to social services health and housing. Recent literature has also addressed policy responses to migration particularly in light of the challenges faced by migrants during the COVID-19 pandemic [27]. Srivastava (2020) argues that migration policies in India have largely been reactive with little attention paid to the structural causes of migration. The pandemic exposed the vulnerabilities of migrant workers especially those from the BIMARU states who faced displacement, job losses and inadequate social protection during the lockdown [28]. Deshingkar and Akter (2009) have called for better social protection mechanisms for migrant workers, including portable welfare benefits, access to affordable housing and labour rights enforcement, particularly for the large number of unskilled migrants from BIMARU states who work in informal sectors across India [29].

Recent studies have increasingly examined internal migration through the lens of spa-

tial interaction, migration networks, and regional inequalities. Research has highlighted the growing concentration of labour migration towards economically developed states and metropolitan regions, emphasizing the persistent role of regional disparities in shaping migration patterns. Advances in spatial analytical techniques and network-based approaches have further improved the understanding of migration systems by capturing the direction, intensity, and connectivity of population flows. In particular, circular (chord) diagrams and network visualization methods have emerged as effective tools for representing complex bilateral relationships, allowing simultaneous visualization of multiple origins, destinations, and migration volumes. Despite these methodological developments, their application to interstate migration in India remains limited, particularly in longitudinal analyses using comparable Census data. The present study addresses this gap by combining migration matrices with chord-based visualization to examine the evolution of bilateral migration corridors between 1991 and 2011, with special emphasis on the BIMARU states.

4 Data & Methodology

Our study analyses internal migration trends in India using secondary data from the Census of India, specifically the D-02 Series covering the periods from 1991 to 2011. This dataset provides comprehensive information on migration flows between states which is crucial for understanding long-term trends and patterns. To visualize migration dynamics, we employed chord diagrams. These diagrams effectively illustrate the volume and direction of migration between states allowing for an intuitive understanding of how people move across regions. The thickness of the chords represents the magnitude of migration making it easier to identify major migration corridors and the relative scale of inflows and outflows. In ad-

dition to chord diagrams, we used migration matrices to present a detailed view of migration patterns over the three census decades. The migration matrix provides a tabular representation of the number of migrants moving from each state to every other state. This method allows us to track changes in migration flows over time highlighting shifts in migration trends, emerging patterns and the evolving role of different states as sources and destinations of migration. By integrating these visualization techniques our methodology offers a robust analysis of internal migration trends capturing both the scale and direction of migration across India's diverse regions. This approach facilitates a comprehensive understanding of how migration patterns have evolved over the decades providing valuable insights into the socioeconomic factors driving these movements. Circular (chord) visualization was selected because it provides a comprehensive representation of bilateral migration flows among multiple states within a single figure. Unlike flow maps, which are constrained by geographical space and often become cluttered when numerous migration links overlap, chord diagrams clearly display the magnitude and direction of inter-state migration simultaneously. Compared with Sankey diagrams, which are more suitable for illustrating sequential processes or hierarchical flows, chord diagrams better represent reciprocal relationships between multiple origins and destinations. Similarly, conventional network graphs effectively depict connectivity but often fail to communicate the volume of bilateral flows as intuitively. Therefore, circular visualization is particularly

appropriate for analysing India's complex interstate migration network, where numerous states act simultaneously as origins and destinations. Bilateral migration data were extracted from the Census of India D-02 migration tables for 1991, 2001, and 2011. A square origin–destination migration matrix was constructed, where rows represented origin states and columns represented destination states. Each matrix element contained the number of migrants moving between a pair of states. The matrices were processed using R to generate circular (chord) diagrams.

In the chord diagrams, each arc (node) represents a state or Union Territory, and the length of the arc is proportional to its total migration volume (inflows and outflows). Ribbons (chords) connect origin and destination states, with ribbon width proportional to the number of migrants exchanged between them. Colours distinguish different states and facilitate identification of migration corridors. The direction of migration is indicated by the orientation of each ribbon from the origin state to the destination state, enabling simultaneous visualization of sending and receiving regions. Larger nodes and wider ribbons therefore indicate states with higher migration intensity and stronger bilateral migration links. This visualization enables the identification of dominant migration corridors, migration hubs, and changes in migration networks across census years that are difficult to observe using conventional tabular summaries or geographic flow maps.

5 Results

Principal Migration Destinations

Delhi (DL): Delhi attracts the greatest single flow of migrants in the dataset, 1,641,514 migrants from Uttar Pradesh (UP) (Table 1). Delhi is the main migration magnet. It also brings in 255,386 migrants from Bihar (BR) and 448,669

migrants from Haryana (HR). Because of its many economic prospects and prestige as a capital city, Delhi continues to play a leading role in migration as seen by this massive influx. Maharashtra (MH): With its important economic centres like Mumbai, Maharashtra attracts 608,218

Table 1: In & Out Migration Matrix of Inter-State of India in 1991

	BR	GJ	HR	MP	MH	DL	RJ	UP
BR	0	40703	63287	201806	98200	255386	41680	523086
GJ	8930	0	3662	69797	608218	17267	106740	14695
HR	25560	13560	0	22636	22120	448669	328893	143834
MP	56580	88944	13110	0	365782	77128	292164	385984
MH	6179	518263	9774	448450	0	44373	35610	50317
DL	4400	14220	163790	26550	39950	0	46137	145964
RJ	27378	324249	352600	335941	211666	22162	0	155880
UP	316507	237591	487969	865772	1010967	1641514	348216	0

Source: Census of India, D-02 Series, 1991. , Note: BR-Bihar, GJ-Gujarat, HR-Haryana, MP- Madhya Pradesh, MH- Maharashtra, DL- Delhi, RJ-Rajasthan, UP- Uttar Pradesh.

migrants from Gujarat (GJ) and 1,010,967 migrants from Uttar Pradesh (UP). The state is a vital node in the migration network that continues to draw significant labour movement due to its strong industrial base and employment opportunities (Figure 1).

Major Migration Origin States

Uttar Pradesh (UP): With significant migration flows to Delhi (1.64 million), Maharashtra (1.01 million), Haryana (487,969), and Rajasthan (348,216), Uttar Pradesh is the state that contributes the most to migration. Because of the state's limited job possibilities and huge local labour surpluses UP is a major labour-sending state, as evidenced by this large out-migration. Bihar (BR): Bihar exhibits high rates of out-migration, with the highest outflow of 523,086 people going to Uttar Pradesh (UP). Additionally, it sends 255,386 migrants to Delhi and 201,806 to Madhya Pradesh (MP) which is a reflection of the state's difficulties finding work locally and its reliance on migration as a tactic for economic growth. The migration of 523,086 people from Bihar to Uttar Pradesh (UP) underscores the interconnectedness of regions and the impact of social connections and physical proximity on migration trends. Gujarat to Maharashtra: The migration of 608,218 people between these two industrially advanced states is indicative of the strong economic relations that exist between them, as a re-

sult of employment possibilities and economic integration. Haryana to Rajasthan: Due to economic opportunities and proximity to other states, there has been a significant influx of people moving from Haryana to Rajasthan, totalling 352,600.

States like Madhya Pradesh (MP) and Rajasthan (RJ) are also emerging as key migration destinations, reflecting their growing industrial development and economic expansion. This cross-regional migration indicates the shifting economic landscape within these states and their increasing appeal as new economic centres.

Delhi (DL): With over 2.2 million migrants from Uttar Pradesh (UP) and 725,565 from Bihar (BR), Delhi is the most popular migration destination. Its standing as the main hub for economic migration within the National Capital Region (NCR) is reinforced by its prominence as a significant economic epicentre. With major cities like Mumbai and Pune, Maharashtra (MH) attracts 2.07 million migrants from Uttar Pradesh (UP) and 361,351 from Bihar (BR) (Figure 2). The state is a labour migration magnet because of its diverse economy which includes construction services and manufacturing. Haryana (HR): Thanks to its advantageous location near Delhi and growing industrial sectors Haryana welcomes around 811,000 migrants from Uttar Pradesh (UP). Uttar Pradesh (UP): With significant out-migration to Delhi (2.29 million), Maharashtra (2.07 million) and Haryana (811,374) Uttar Pradesh

emerges as the state with the greatest out-migration. This is a reflection of Uttar Pradesh's status as a labour-surplus state that mostly depends on migration for its economic survival. Bihar (BR): Bihar is an important state of origin as well sending a sizable number of migrants to Delhi (725,565), Maharashtra (361,351) and Jharkhand (1.08 million) (Table 2). This movement is a reflection of Bihar's difficulties finding work locally. Bihar-Jharkhand: The notable 1.08 million migrant movement from Bihar to Jharkhand highlights the long-standing cultural and historical ties between these two states. Gujarat-Maharashtra: The strong economic ties between these two industrial giants are exemplified by the 849,045 people who moved from Gujarat to Maharashtra. Rajasthan-Haryana: Due to their prox-

imity to the economically thriving NCR region, 488,790 persons moved from Rajasthan to Haryana, reflecting the labour force's movement among adjacent states. The states of Uttar Pradesh (UP) and Maharashtra (MH) have the largest bilateral migration flow, with over 2.84 million migrants living there (Table 3). Owing to its better job chances and economic prospects Maharashtra and especially Mumbai, serve as important economic hubs that draw workers from Uttar Pradesh. The states of Uttar Pradesh (UP) and Delhi (DL) account for the second-highest migration flux with over 3.42 million individuals migrating between them (Figure 3). Delhi is a popular destination for migrants from Uttar Pradesh because of its proximity to the state as well as its standing as a major hub for trade jobs and services.

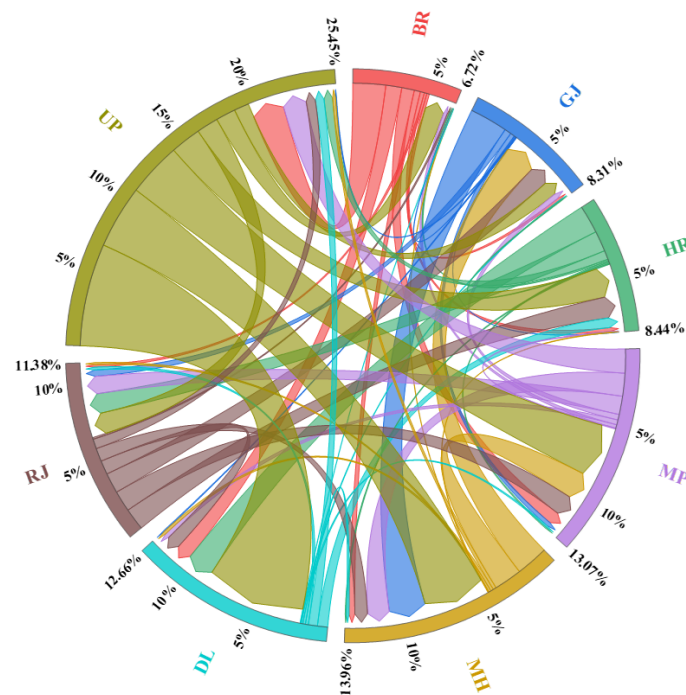


Figure 1: Bilateral Internal Migration in India, 1991. Source: Census of India, D-02 Series, 1991 (Author's computation). Note: BR-Bihar, GJ-Gujarat, HR-Haryana, MP- Madhya Pradesh, MH- Maharashtra, DL- Delhi, RJ-Rajasthan, UP- Uttar Pradesh.

Uttar Pradesh (UP) and Rajasthan (RJ): A strong 870,038 migratory flow exists between these two states, suggesting that

both job prospects and sociocultural elements like marriage are major drivers of migration. 1.34 million people migrate be-

Table 2: In & Out Migration Matrix of Inter-State of India in 2001

	BR	GJ	HR	JH	MP	MH	DL	RJ	UP
BR	0	146,495	237,519	1,080,794	93,339	361,351	725,565	81,130	621,010
GJ	68,080	0	7,662	9,965	53,063	849,045	30,334	139,297	23,182
HR	21,389	18,397	0	4,479	19,168	39,839	555,173	351,234	165,918
JH	340,262	23,782	14,007	0	23,789	58,208	112,716	10,647	133,768
MP	5,981	131,745	27,491	8,871	0	589,745	100,153	361,685	463,175
MH	39,964	655,080	17,200	6,051	373,781	0	63,544	45,770	47,114
DL	8,802	14,461	261,689	3,365	21,435	69,266	0	45,612	301,690
RJ	21,609	391,649	488,790	10,669	335,849	431,190	275,045	0	192,369
UP	437,060	447,325	811,374	104,595	849,232	2,072,193	2,296,367	369,754	0

Source: Census of India, D-02 Series, 2001. Note: BR- Bihar, GJ- Gujarat, HR- Haryana, JH- Jharkhand, MP- Madhya Pradesh, MH- Maharashtra, DL- Delhi, RJ- Rajasthan, UP- Uttar Pradesh.

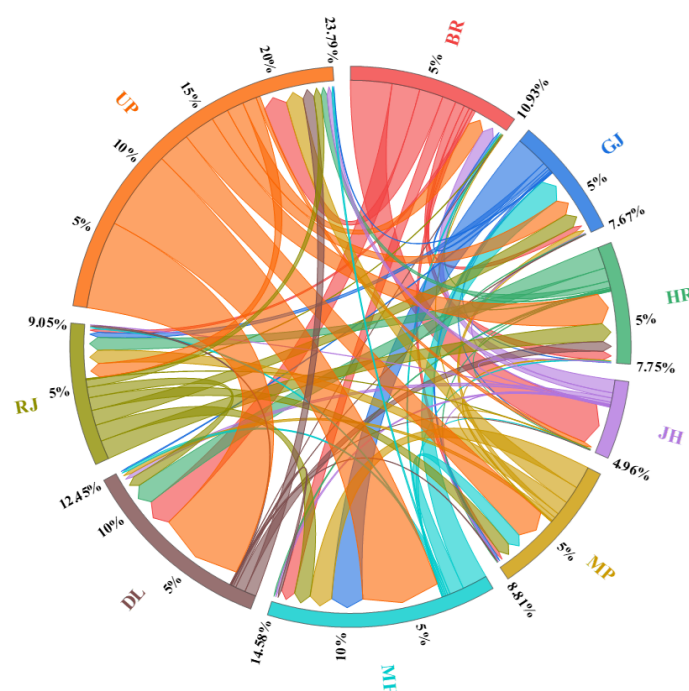


Figure 2: Bilateral Internal Migration in India, 2001. Source: Census of India, D-02 Series, 2001 (Author's computation). Note: BR- Bihar, GJ- Gujarat, HR- Haryana, JH- Jharkhand, MP- Madhya Pradesh, MH- Maharashtra, DL- Delhi, RJ- Rajasthan, UP- Uttar Pradesh.

Table 3: In & Out Migration Matrix of Inter-State of India in 2011

	BR	GJ	HR	JH	MP	MH	DL	RJ	UP
BR	0	361,010	390,937	1,336,048	125,836	568,667	1,106,629	134,402	1,072,739
GJ	4,149	0	11,250	5,268	88,702	983,653	24,153	200,767	25,459
HR	3,902	32,206	0	3,729	19,224	48,673	666,331	533,963	230,740
JH	433,696	49,576	20,853	0	30,272	100,285	69,196	13,183	110,358
MP	6,067	274,773	56,240	10,885	0	824,624	134,867	554,058	668,537
MH	13,544	971,975	30,907	9,727	494,312	0	63,692	73,366	88,310
DL	23,412	28,596	468,298	7,643	28,597	86,131	0	83,134	566,210
RJ	8,358	747,445	611,160	10,240	500,481	570,233	315,238	0	284,056
UP	319,887	929,411	1,113,535	107,724	1,090,881	2,754,706	2,854,297	585,982	0

Source: Census of India, D-02 Series, 2011. Note: BR- Bihar, GJ- Gujarat, HR- Haryana, JH- Jharkhand, MP- Madhya Pradesh, MH- Maharashtra, DL- NCT of Delhi, RJ- Rajasthan, UP- Uttar Pradesh.

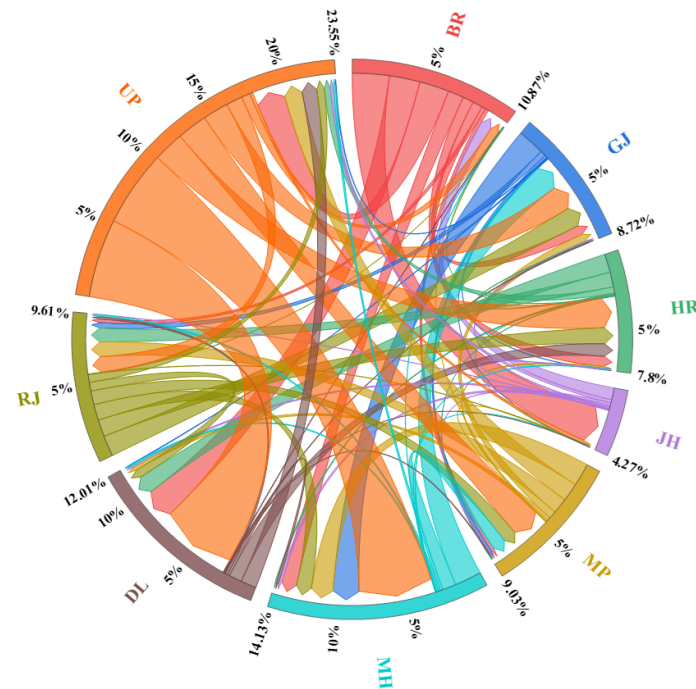


Figure 3: Bilateral Internal Migration in India, 2011. Source: Census of India, D-02 Series, 2011 (Author's computation). Note: BR- Bihar, GJ- Gujarat, HR- Haryana, JH- Jharkhand, MP- Madhya Pradesh, MH- Maharashtra, DL- NCT of Delhi, RJ- Rajasthan, UP- Uttar Pradesh.

tween Uttar Pradesh (UP) and Haryana (HR) indicating a significant relationship that may be impacted by Haryana's potential for growth in the agricultural and industrial sectors of UP's neighbouring districts. Maharashtra (MH) and Gujarat (GJ): These two industrialized states have strong economic ties as seen by the 1.96 million large bilateral migratory flow between them. Career prospects in sectors like textiles chemicals and finance are what are driving this movement. Madhya Pradesh (MP) and Maharashtra (MH): Opportunities in Maharashtra's economic hubs have driven 1.32 million migrants between these two states indicating the closeness and economic relations between them. Therefore because of its economic hubs in Mumbai and Pune Maharashtra continues to be a popular destination for migrants from less developed or rural areas like Uttar Pradesh Madhya Pradesh and Bihar. Delhi (DL): The city's significant influx of migrants from UP (3.42 million) Bihar (1.13 million) and Haryana (1.13

million) highlights its appeal as a migration hub. Delhi the nation's capital and home to a booming economy, provides a wide range of formal and informal employment opportunities. Of these the flow into UP is particularly noteworthy due to its size which is probably a result of Delhi's proximity to the region as well as the influx of rural labourers looking for work in the retail, services and construction industries. Rajasthan (RJ) and Haryana (HR): The 1.14 million-strong migration movement between these two states demonstrates the impact of proximity and economic integration. Rajasthani migrants are probably drawn to Haryana by the state's booming agricultural industry and the industrial growth around towns like Gurgaon and Faridabad [30]. Madhya Pradesh (MP) and Rajasthan (RJ): 1.05 million people commute between these two states bilaterally indicating strong migration trends driven by rural-to-urban migration to cities like Jaipur and Indore or agricultural labour mobility [31-34]. Mar-

riage migrant: Marital status has an impact on many migrant movements, especially those from Rajasthan Bihar and Uttar Pradesh. In these areas social dynamics and customs frequently have a greater influence on female migration than just economic factors [35-37]. The main cause of the significant bilateral migration flow between Maharashtra and Gujarat which is close to 2 million migrants, is labour migration seeking higher-paying jobs. This covers both the official (IT, finance) and informal (manufacturing, building) industries [38-41]. In 1991, there was a significant out-migration from Bihar with 523,086 people going to Uttar Pradesh (UP), 201,806 to Jharkhand, 255,386 to Maharashtra (MH), and 41,680 to Delhi and other places (DL). Given the dearth of local job possibilities this illustrates Bihar's importance as a labour supply. 2001: Bihar saw a sharp increase in migration with increases of 621,010 to Uttar Pradesh, 361,351 to Maharashtra, 725,565 to Delhi and 1,080,794 to Jharkhand. The increase in out-migration is a result of the establishment of Jharkhand in 2000, which has made the problem worse. 2011: Bihar's out-migration figures kept rising reaching 1,106,629 to Delhi, 1,072,739 to Uttar Pradesh and 568,667 to Maharashtra. Raising the migration to Jharkhand further underscored Bihar's ongoing labour exodus specially to emerging or expanding economic hubs. Bihar exhibits a relentless rise in out-migration particularly to economically attractive destinations like Delhi Maharashtra and Uttar Pradesh with significant increases post-Jharkhand formation. 1991: Delhi (1,641,514), Maharashtra (1,010,967) and Haryana (487,969) received a significant amount of out-migration from Uttar Pradesh. The fact that Uttar Pradesh is a major recipient of migration is further evidenced by the inflows from Bihar (316,507). 2001: 2,072,193 migrants from Uttar Pradesh moved to Maharashtra and 2,296,367 to Delhi, representing a sharp increase in out-migration. This demonstrates UP's grow-

ing significance in the migration landscape as a source and a destination. 2011: The number of UP migrants increased even further, with 2,754,706 people migrating to Maharashtra and 2,854,297 to Delhi. This strengthens Uttar Pradesh's standing as the main migration source maintaining its rise throughout the years. Uttar Pradesh consistently leads in out-migration particularly to Delhi and Maharashtra with numbers rising sharply from 1991 to 2011. 1991: Maharashtra attracted 1,010,967 migrants from Uttar Pradesh, 608,218 from Gujarat (GJ), and 448,450 from Madhya Pradesh (MP) underscoring its status as a major economic hub. 2001: Migration to Maharashtra from Uttar Pradesh increased to 849,232, with 655,080 from Gujarat and strong inflows from MP (589,745), reflecting Maharashtra's growing economic magnetism. 2011: The trend continued with Maharashtra receiving 2,754,706 migrants from UP, 983,653 from Gujarat, and 824,624 from MP. The state's status as a major migration destination was reinforced by these substantial increases. 1991: Maharashtra's role as a key economic hub was highlighted by the 1,010,967 migrants it attracted from Uttar Pradesh, 608,218 from Gujarat (GJ) and 448,450 from Madhya Pradesh (MP). 2001, Due to Maharashtra's increasing economic appeal, migration from Uttar Pradesh to the state rose to 849,232 with 655,080 coming from Gujarat and 589,745 from MP. In 2011, the pattern persisted as Maharashtra received 2,754,706 migrants from Uttar Pradesh, 983,653 from Gujarat and 824,624 from Madhya Pradesh. These significant increases strengthened the state's standing as a popular destination for migration. 1991: Gujarat was a major source of the labour movement as seen by the significant out-migration to Rajasthan (106,740) and Maharashtra (608,218). 2001: movement numbers stayed high, indicating steady movement patterns with notable outflows to Rajasthan (139,297) and Maharashtra (849,045). 2011 saw a rise in Gujarat's out-migration with 983,653 peo-

ple leaving for Maharashtra and 200,767 people leaving for Rajasthan highlighting the state's ongoing contribution of labour to economically vibrant states. In 1991, Haryana experienced significant inflows from Uttar Pradesh (487,969) and outflows to Delhi (448,669) and Rajasthan (328,893), demonstrating its dual role as a source and destination. 2001: There was still considerable out-migration to Delhi (555,173) and Rajasthan (351,234), while Uttar Pradesh (811,374) continued to net inflows. 2011: Haryana had a constant influx of people from Uttar Pradesh and a steady outflow of 666,331 people to Delhi and Rajasthan. Haryana functions as both a source and a destination for migration, with significant flows to Delhi and Rajasthan, and consistent inflows from Uttar Pradesh. In 1991, Madhya Pradesh had a significant influx of 365,782 migrants from Uttar Pradesh and a noteworthy outflow of 448,450 migrants to Maharashtra indicating its dual role in migration. 2001: MP saw increasing emigration to Maharashtra (589,745) and continued to draw migrants from UP (463,175). 2011: The state continued to have significant migration inflows from UP (668,537) and outflows to Maharashtra (824,624) highlighting its dual function as a migration source and destination. Madhya Pradesh's migration patterns highlight its role as both a significant source and destination, particularly with Uttar Pradesh as a major source.

6 Discussion

From 1991 to 2011, internal migration in India escalated significantly. This surge is primarily due to stark economic disparities between states. Bihar and Uttar Pradesh have remained major sources of migrants due to insufficient local job opportunities, underdeveloped infrastructure, and minimal industrialization. These regions display a continuous trend of out-migration as labourers migrate to more industrialized and urbanized areas in search

of better livelihoods [42]. Delhi and Maharashtra have emerged as prime destinations for internal migrants. Rapid urbanization and industrial growth have rendered these states attractive to rural and semi-urban migrants seeking employment [43]. Maharashtra's migration inflows from Uttar Pradesh surged from 1,010,967 in 1991 to 2,754,706 in 2011, illustrating the state's expanding economic appeal. Similarly, Delhi's inflows from Uttar Pradesh rose from 1,641,514 in 1991 to 2,854,297 in 2011 highlighting its crucial role as an economic hub. Uttar Pradesh and Bihar have consistently been the largest sources of out-migration over the three decades. Uttar Pradesh's outflows dramatically increased particularly towards Maharashtra and Delhi. Despite being India's most populous state Uttar Pradesh has struggled to retain its labour force due to inadequate economic opportunities [44-45]. By 2011, migration from UP to Maharashtra had more than doubled compared to 1991. Similarly, Bihar's migration to Delhi grew from 255,386 in 1991 to 1,106,629 in 2011 reflecting escalating economic pressures driving people to migrate. Migration data reveals significant flows between neighbouring states not just distant economic centres. For example, migration between Bihar and Jharkhand surged after Jharkhand's bifurcation in 2000 with 1,336,048 migrants moving from Bihar to Jharkhand by 2011. Likewise, migration between Haryana and Delhi demonstrates regional interdependencies. These flows are influenced by not only economic factors but also social ties linguistic similarities, and cultural connections [46]. 1991: Migration was primarily influenced by urban centres like Delhi and Mumbai. States like Uttar Pradesh and Bihar saw migration to these hubs due to job opportunities in industries construction and the informal sector. Migration flows were relatively modest compared to later periods. 2001: The early 2000s saw a surge in migration due to new state formations (e.g., Jharkhand) and increased industrialization. Outflows

from Bihar to Jharkhand spiked, driven by administrative changes and new opportunities in the mining and industrial sectors. 2011: Migration patterns intensified with increased labour movement to Delhi and Maharashtra driven by high economic growth expanding infrastructure and persistent rural-urban disparities [47]. Migration flows doubled in many cases facilitated by improved transportation and communication infrastructure [48]. Economic factors have consistently dominated migration patterns. Push factors in source states such as unemployment agrarian distress and limited industrialization contrast sharply with the pull factors in destination states like Maharashtra Delhi and Gujarat. These destinations offer jobs in construction, manufacturing and services attracting labourers in large numbers [49-50]. For instance, Maharashtra's migration inflows from Gujarat (983,653 in 2011) and Madhya Pradesh's outflows to Maharashtra (824,624 in 2011) highlight how economic prosperity in urban centres continues to pull migrants from less developed areas. The movement from rural regions in Uttar Pradesh, Bihar, Madhya Pradesh and Jharkhand to urban centres like Delhi, Mumbai, and Gujarat has placed immense pressure on urban infrastructures, exacerbating challenges related to housing, sanitation, and public health. The continuous influx of migrants has intensified the housing crisis, with many living in informal settlements. Despite these challenges, economic opportunities remain the primary driver of migration [51-52].

The observed bilateral migration patterns reflect long-standing structural inequalities in India's regional development. States such as Bihar and Uttar Pradesh continue to function as major labour-exporting regions because of their high population pressure, dependence on agriculture, low industrialization, and limited non-farm employment opportunities. In contrast, Maharashtra, Delhi, Gujarat, and Haryana have experienced sustained economic growth, industrial expansion, and

rapid urbanization, creating strong demand for both skilled and unskilled labour. These migration corridors therefore represent not only economic exchanges but also demographic adjustments, whereby surplus labour from less-developed regions is absorbed by more prosperous states. The persistence of these corridors across three Census decades suggests that regional disparities remain deeply embedded despite economic reforms and development initiatives. Furthermore, the prominence of neighbouring-state migration, such as Bihar-Jharkhand and Delhi-Haryana, indicates that geographical proximity, shared language, cultural affinity, social networks, and lower migration costs continue to play an important role in shaping interstate migration alongside economic incentives.

7 Policy Implications

The findings have important implications for migration and regional development policies in India. First, the persistent out-migration from the BIMARU states highlights the need for balanced regional development through greater investment in industrialization, rural non-farm employment, skill development, and infrastructure to reduce distress-driven migration. Second, destination states such as Delhi, Maharashtra, Gujarat, and Haryana should strengthen labour market policies by improving access to affordable housing, healthcare, social security, and skill recognition for migrant workers, thereby promoting their social and economic integration. Third, the identification of major bilateral migration corridors can support evidence-based regional planning by enabling governments to anticipate migration flows and plan transport, housing, education, and urban infrastructure accordingly. Finally, strengthening interstate coordination, improving migration data systems, and ensuring the portability of social protection benefits would facilitate more effective migration management while pro-

moting inclusive and balanced regional development across India.

8 Conclusion

The analysis of migration flows from 1991 to 2011 underscores a sustained rise in internal migration driven by economic imbalances across states. The explosive growth in migration to urban hubs like Delhi Mumbai and Gujarat highlights the deep structural disparities between industrialized and underdeveloped regions. The significant outflows from Uttar Pradesh and Bihar reflect ongoing economic challenges with many seeking better living conditions and employment opportunities in more developed areas. These trends emphasize the urgent need for balanced regional development job creation in rural areas and improved infrastructure in migrant-receiving cities to manage the pressures of urbanization and ensure sustainable livelihoods across India.

Declaration of Conflict of Interests

The authors declare that there are no conflicts of interest regarding the research, authorship, or publication of this article.

Availability of Data and Materials

The dataset used in this study is available in the public domain.

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