Indian Journal of Economics and Finance (IJEF)
ISSN: 2582-9378 (Online), Volume-6 Issue-2, November 2026

Regional Economic Disparities between North and South Bihar: A Quantitative Framework for District-Level Development Analysis

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Abstract: ***This study examines regional economic disparities between North and South Bihar using district-level indicators from the Bihar Economic Survey 2025–26, the 2022–23 Bihar Caste-Based Survey and NITI Aayog's multidimensional poverty framework. The North–South comparison is recast as a testable regional-development problem. Per-capita Gross District Domestic Product (GDDP) is the principal outcome variable, while industrial structure, infrastructure, human development, poverty and hydrological exposure form the principal explanatory dimensions. The empirical framework combines regional mean and median comparisons, dispersion measures, a North-Bihar indicator model, and robustness tests excluding influential districts such as Patna and Begusarai. Where multi-year district data are available, we propose convergence and fixed-effects specifications. The latest official evidence indicates pronounced spatial concentration of economic activity, with Patna exerting substantial leverage on South Bihar's aggregate position and flood-exposed agrarian districts concentrated toward the lower end of the income distribution. The framework therefore interprets Bihar's regional divide as the joint outcome of agglomeration, sectoral diversification, infrastructure, human capital and environmental vulnerability.***

Keywords: Bihar, Regional Disparity, North Bihar, South Bihar, Per-Capita Income, GSDP, Poverty, Agro-Climatic Zones, Economic Geography.

Nomenclature:
GSDP: Gross State Domestic Product
DES: Directorate of Economics & Statistics
MPI: Multidimensional Poverty Index

I. INTRODUCTION

Bihar occupies a paradoxical position in the Indian economy. It is simultaneously one of the fastest-growing state economies of the last decade and the state with the lowest per-capita income in the country. Its Gross State Domestic Product (GSDP) for 2024–25 is estimated at ₹9,91,997 crore at current prices and ₹5,31,372 crore at constant (2011–12) prices, growing 13.1% and 8.6%, respectively, well above the corresponding national rates [1], [2]. Yet per-capita income, at ₹76,490 (current) and ₹40,973 (constant) for 2024–25, remains the lowest among Indian states and roughly a third of the all-India average [1].

Averages, however, conceal a deep internal geography. The Ganga flows west to east through the middle of the state, dividing it into two unequal halves: North Bihar (about 53,300 km²) and South Bihar (about 40,900 km²) [3]. These are not merely cartographic labels; they mark a genuine economic and hydrological boundary. North Bihar is a densely populated, intensively farmed alluvial plain fed by Himalayan rivers and chronically vulnerable to flooding. South Bihar, bordered by the Chhotanagpur plateau, is drier, more drought-prone, but historically closer to the state's industrial and mineral base and home to the capital, Patna [3].

This paper asks a focused question: How do North Bihar and South Bihar compare in economic status today, and what explains the gap? It draws on the newest official statistics to move beyond anecdote and quantify the divide across per-capita output, sectoral structure, poverty, infrastructure and human development.

A. Objectives

i. To compare per-capita income and district-level output between North and South Bihar using the latest data.
ii. To examine differences in sectoral composition, poverty incidence and human-development indicators.
iii. To identify the geographical, historical and institutional causes of the divide.
iv. To suggest evidence-based policy directions for balanced regional development.

II. DATA AND METHODOLOGY

The study is descriptive and analytical, relying entirely on secondary data from official and peer-reviewed sources:

- Bihar Economic Survey 2025–26 (20th survey, tabled February 2026; figures for FY 2024–25) [1] and the 2024–25 edition [4], published by the Directorate of Economics & Statistics (DES), Government of Bihar, the primary source for GSDP, per-capita income and district-level Gross District Domestic Product (GDDP).
- 2022–23 Bihar Caste-Based Survey (socio-economic data tabled in November 2023)—for household-income poverty [5].
- NITI Aayog National Multidimensional Poverty Index (MPI) reports, for non-income deprivation [6].
- Peer-reviewed studies on flood damage and inter-district disparity in agricultural and social development [3], [7].

Manuscript received on 19 September 2026 | First Revised Manuscript received on 10 October 2026 | Second Revised Manuscript received on 28 October 2026 | Manuscript Accepted on 15 November 2026 | Manuscript published on 30 November 2026.

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Regional Definition: Following the standard hydrological convention, districts are classified as North or South Bihar by their position relative to the Ganga [3]:

i. **North Bihar (21 Districts):** West Champaran, East Champaran, Sitamarhi, Sheohar, Muzaffarpur, Vaishali, Darbhanga, Madhubani, Samastipur, Saran, Siwan, Gopalganj, Begusarai, Khagaria, Saharsa, Supaul, Madhepura, Araria, Kishanganj, Purnia, Katihar.

ii. **South Bihar (17 Districts):** Patna, Bhojpur, Buxar, Kaimur, Rohtas, Arwal, Jehanabad, Aurangabad, Gaya, Nawada, Nalanda, Sheikhpura, Lakhisarai, Munger, Jamui, Banka, Bhagalpur.

Two caveats apply. First, published district figures mix constant (2011–12) and current prices; each table below states which is used. Second, Patna district straddles the river but, with its urban core and administrative functions on the south bank, is conventionally counted in South Bihar. This decision materially shapes the comparison, since Patna dominates the state economy [1].

A. Empirical Strategy and Testable Hypotheses

The North–South comparison can be formalised as H_0: $\mu N = \mu S$ against H_1: $\mu N \neq \mu S$, where μN and μS denote mean district-level per-capita GDDP in North and South Bihar. Because major urban-industrial centres may skew the distribution, supplement mean comparisons with medians and a Mann–Whitney test.

- **Regional Mean Gap and Dispersion:** The absolute and relative gaps, and within-region dispersion, are measured as:

$$\Delta = \bar{y}S - \bar{y}N; \quad \text{Relative Gap} = \left[\frac{(\bar{y}S - \bar{y}N)}{\bar{y}N}\right] \times 100 \qquad (1)$$

$$CVr = \frac{sr}{\bar{y}r}, \; r \in \{North, South\} \qquad (2)$$

B. Cross-Sectional Model

$$\ln(GDDPi) = \alpha + \beta 1 Northi + \beta 2 Industryi + \beta 3 Infrastructurei + \beta 4 HumanCapitali + \beta 5 Povertyi + \beta 6 FloodExposurei + \varepsilon i \qquad (3)$$

Northi equals one for districts north of the Ganga and zero otherwise. β1 measures the conditional North–South differential after controlling for observable structural characteristics. Estimation should use heteroskedasticity-robust standard errors. With only 38 districts, the specification should remain parsimonious, and multicollinearity should be checked.

- **Robustness Tests:** Three specifications are estimated: (i) all 38 districts; (ii) excluding Patna, whose administrative and service-sector concentration may dominate the South Bihar mean; and (iii) excluding both Patna and Begusarai, the latter being an industrial outlier in North Bihar. This distinguishes a broad regional differential from an outlier-driven comparison.
- **Optional Panel Extension:** If comparable district GDDP data are assembled over several years, district and year fixed effects can be estimated, and conditional β-convergence examined, as follows:

$$\ln(GDDPit) = \alpha i + \lambda t + \beta Xit + \varepsilon it \qquad (4)$$

$$\Delta \ln(GDDPit) = \alpha + \gamma \ln(GDDPi, t-1) + \theta Xit + \varepsilon it \qquad (5)$$

In Equation (5), $\gamma < 0$ is consistent with poorer districts growing faster conditional on covariates. Tabhane [10] applies this convergence framework to sub-districts in Bihar and Jharkhand.

C. Measurement and Data Consistency

All monetary observations entering the same statistical test should use a common price basis. Current-price and constant-price GDDP should not be pooled. Variables from different reference years should be explicitly labelled. Unless stronger identification is introduced, interpret regression coefficients as conditional associations rather than causal effects.

III. THE ORIGINS OF THE DIVIDE: GEOGRAPHY AND HISTORY

A. Tale of Two Water Regimes

The single most important structural fact about Bihar's regional economy is water. North Bihar receives the discharge of Himalayan rivers, the Kosi, Gandak, Bagmati, Kamla and Mahananda, which swell violently during the monsoon [3]. Official estimates place about 73 per cent of Bihar's geographical area and 76 per cent of its population under recurrent flood threat [8], and roughly three-quarters of North Bihar is regarded as flood-affected, with the Kosi ("the Sorrow of Bihar") causing recurrent devastation [9]. Between 2001 and 2022, six northern districts, Madhubani, Darbhanga, Muzaffarpur, East Champaran, Sitamarhi and Samastipur, accounted for around half of total flood-led damage in the state [3]. South Bihar, drained by shorter plateau-origin rivers such as the son, Punpun and Phalgu, faces the opposite problem: sparse, erratic rainfall and recurrent drought, with growing groundwater depletion [8], [9].

This dual regime produces a paradox. North Bihar's flood-deposited alluvium is highly fertile. It supports high crop yields per hectare, yet per-capita income remains low because of extreme population pressure on land, fragmented and unequal landholdings, annual flood destruction of assets, and weak development of the secondary and tertiary sectors. High-flood-risk districts have recorded significantly lower growth in per-capita GDDP than low-risk districts [3], and composite district indices show that agricultural and social development remain unevenly distributed and strongly correlated across Bihar's regions [7]. Fertility, in other words, has not translated into prosperity.

B. The Jharkhand Bifurcation of 2000

A decisive historical event was the reorganisation of Bihar in November 2000, which carved out 18 southern, mineral-rich districts to form the new state of Jharkhand. Much of undivided Bihar's mining and

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heavy-industrial base went with them, leaving the residual state with a largely agrarian economy [10]. Recent quasi-experimental evidence using night-time light data finds that economic activity in Jharkhand's border areas grew roughly 22 per cent faster than in adjoining areas of Bihar after bifurcation [10]. Crucially, the lost mineral and heavy-industrial belt lay to the south. What remained as "South Bihar" was the residual plain immediately north of the plateau, less industrial than the departed region but still comparatively better placed than the north because it retained the capital, key industrial nodes, and better connectivity.

C. Agrarian Institutions

Historical land relations reinforced the gap. The Tirhut region of North Bihar- Champaran, Saran, Muzaffarpur and Darbhanga- was the centre of exploitative colonial indigo cultivation (the *Teen Kathiya* system). Extractive tenancy arrangements concentrated surplus in the hands of zamindars and planters, leaving cultivators asset-poor, a legacy that is often linked to the region's persistent under-development.

IV. COMPARATIVE ECONOMIC ANALYSIS

A. Per-Capita Output: The Headline Gap

The clearest single measure of the divide is per-capita Gross District Domestic Product (GDDP). Table I reports the three richest and three poorest districts as ranked in the Bihar Economic Survey 2025–26 [1].

Table I: Richest and Poorest Districts of Bihar by Per-Capita GDDP, 2024–25 (Constant 2011–12 Prices)

Rank	District	Region	Per-Capita GDDP (₹)
1	Patna	South	1,31,332
2	Begusarai	North	61,566
3	Munger	South	54,469
36	Sitamarhi	North	24,332
37	Araria	North	23,670
38	Sheohar	North	22,047

Source: Bihar Economic Survey 2025–26 [1]. Ranks 1–3 is the richest and ranks 36–38 the poorest of 38 districts.

The pattern is stark. Patna's per-capita output is close to six times that of the poorest district, Sheohar. All three of the poorest districts- Sheohar, Araria and Sitamarhi- lie in North Bihar. Two of the three richest, Patna and Munger, lie in South Bihar. In current-price terms, the gap is even wider: Patna's per-capita GDP for 2023–24 has been reported at over ₹2 lakh, against roughly ₹1.06 lakh for Begusarai and ₹94,000 for Munger [4].

A recurring finding across survey years is that only a handful of districts exceed the state average, and they cluster in the south and along the industrial corridor: Patna, Munger, Bhagalpur and Rohtas (all South Bihar), plus Begusarai in the north [1], [4]. Independent analyses report the same Patna-Sheohar contrast, which skews the state average and masks deep internal inequality [9].

- **The Begusarai Exception:** Begusarai illustrates that the divide is structural, not deterministic. It sits on the north bank of the Ganga yet ranks second in the state because it hosts a concentration of heavy industry: the Barauni oil refinery (IOCL), the Barauni fertiliser unit (HURL), and an NTPC thermal plant. Where industry exists, a North Bihar district can prosper; the point is that such industrial anchors are overwhelmingly absent from the rest of the north.

B. Sectoral Composition

At the state level, the 2025–26 survey reports the tertiary (services) sector contributing 54.8% of Gross Value Added, the secondary sector 26.8%, and the primary sector 18.3% [1]. Yet employment tells the opposite story: the primary sector still employs about 54% of workers, against 24% in the secondary and 22% in the tertiary sector [1], a classic signature of low agricultural productivity and surplus farm labour. Manufacturing alone engaged only about 5.7 per cent of workers in 2022–23 [11]. This state aggregate maps onto the regional divide:

- **North Bihar** remains predominantly agrarian. Its economy rests on paddy, wheat, maize, makhana (fox-nut, a Mithila speciality), litchi (Muzaffarpur), sugarcane and dairy. Despite high yields, value addition is minimal, and agro-processing is thin, so the multiplier effects of a diversified economy are largely absent [7].
- **South Bihar** is comparatively diversified, combining Patna's concentrated services economy (administration, trade, finance, health, education) with industrial nodes, stone and cement around Rohtas /Kaimur, and manufacturing near Patna and Bhagalpur (silk), together with Barauni's petrochemicals in the central corridor (technically in north-bank Begusarai).

The services sector's dominance is therefore also a geographic statement: it is heavily Patna-centric, and Patna is in the south.

C. Income Poverty: The Caste-Based Survey

The 2022–23 Bihar Caste-Based Survey provides the most granular recent picture of household poverty. Its central finding: about 94 lakh families, 34.13% of Bihar's roughly 2.76–2.97 crore families, subsist on a monthly income of ₹6,000 or less (about ₹200 a day for the whole household). Some 63% of families earn under ₹10,000 a month [5].

Poverty is sharply unequal by social group, and this compounds the regional divide because caste composition varies across the state. About 42% of Scheduled Caste and Scheduled Tribe households and roughly a third of Backward and Extremely Backward Class households are poor, against about 25% of upper-caste households [5]. The Extremely Backward Classes, the single largest social bloc at over a third of the population, are heavily represented among the poor. Because North Bihar's densely settled agrarian districts carry large EBC, SC and marginal-farmer populations, the income-poverty burden falls disproportionately there.

D. Multidimensional Poverty

Income is only one axis. NITI Aayog's National Multidimensional Poverty Index (MPI), which captures deprivation in health, education and living standards, has consistently placed Bihar as the poorest state in India by

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this measure [6]. Earlier assessments based on NFHS-4 found around half the population multidimensionally poor; the NFHS-5-based estimate of 33.76 per cent shows meaningful improvement but still leaves Bihar with the highest MPI headcount nationally, against an all-India figure of 14.96 per cent [2], [6]. Nutrition indicators remain severe: NFHS-5 reports child stunting at 42.9%, underweight at 41.0%, and wasting at 22.9% [12]. These deprivations are concentrated in exactly the flood-exposed, agrarian northern districts where public services are thinnest [3], [7].

E. Infrastructure and Human Development

Infrastructure gaps track and reinforce the output gap:

- **Electricity:** The top five districts in power consumption- Patna, Gaya, Muzaffarpur, Rohtas and Nalanda- are dominated by South Bihar (four of five), a rough proxy for where industrial and commercial demand sits. State per-capita power consumption rose from 134 kWh (2012–13) to 363 kWh (2023–24), but gains are uneven [1].
- **Fuel Demand:** Patna records the highest petrol, diesel and LPG consumption in the state- a marker of concentrated urban-commercial activity in the south [1].
- **Roads:** Bihar's overall road density is high by national standards (3rd in India) [1]. Still, connectivity quality and last-mile access remain weaker in flood-prone northern districts, where infrastructure is repeatedly damaged and rebuilt [3].
- **Human Development:** The Periodic Labour Force Survey 2023–24 reports a literacy rate of 74.3 per cent in Bihar, compared with 80.9 per cent nationally [2], still among the lowest in India, with female literacy and schooling markedly weaker [12], particularly in northern agrarian districts [7]. Life expectancy has improved to roughly 68.9 years (male) and 69.7 years (female) [1].

F. Summary Comparison

Table II consolidates the dimensions discussed above.

Table II: Summary Comparison of North and South Bihar

Dimension	North Bihar	South Bihar
Area	~53,300 km²	~40,900 km²
Dominant Water Risk	Flooding (Kosi, Gandak, Bagmati)	Drought; Groundwater Depletion
Economic Base	Agriculture, Dairy, Horticulture	Services (Patna) + Scattered Industry
Per-Capita Output	Lowest Districts (Sheohar, Araria, Sitamarhi)	Highest District (Patna); Munger, Bhagalpur, Rohtas Above Average
Notable Exception	Begusarai (Industrial, Ranks 2nd)	—
Poverty Incidence	Higher; Large EBC/SC farm Populations	Lower on Average; Prosperity Concentrated in Patna
Infrastructure	Weaker, Flood-Damaged	Stronger, Capital-Centred

Source: Author's compilation from [1], [3], [5], [7] and [8].

G. Statistical Tests and Reporting Framework

For journal submission, the descriptive comparison should be complemented by a results table reporting the number of districts, mean, median, standard deviation, coefficient of variation, North–South mean difference, Welch t-statistic and p-value, and Mann–Whitney statistic and p-value. These values must be calculated from the complete district dataset and are not inferred here from selected richest/poorest districts.

A second table should report cross-sectional regression coefficients from Equation (3) with robust standard errors, R^2/adjusted R^2, sample size and diagnostics. A third robustness table should compare the North indicator coefficient for the full sample, excluding Patna, and excluding Patna plus Begusarai. Appendices A and B list the recommended variables and outputs.

V. DISCUSSION

Three points deserve emphasis.

i. First, the divide is real but not absolute. North Bihar is not uniformly poor (Begusarai), and South Bihar is not uniformly rich (Jamui, Sheikhpura and Nawada are modest). The more accurate statement is that prosperity in Bihar is concentrated in the south and, above all, in Patna. In contrast, chronic poverty is concentrated in the north-eastern and north-central agrarian belt (Sheohar, Sitamarhi, Araria, Madhubani, Supaul, East Champaran) [1], [3].

ii. Second, growth has not yet produced convergence. Bihar's rapid headline growth is welcome, but a rising state average can coexist with widening internal gaps if growth is spatially concentrated, as the district data suggest [1], [9]. Patna and a few corridor districts are driving fast state growth disproportionately, while high-flood-risk districts lag in GDDP growth [3].

iii. Third, the causes are structural and mutually reinforcing. Hydrology (flood versus drought), the loss of the southern industrial base to Jharkhand [10], extractive agrarian history, and thin agro-processing combine so that North Bihar's genuine agricultural strength does not convert into income. Breaking this requires interventions aimed squarely at the mechanisms, not just at aggregate growth.

VI. POLICY DIRECTIONS

A. Flood Management as Economic Policy in the North. Treating recurrent flooding as a development constraint—through embankment modernisation, Kosi basin management, flood-resilient rural infrastructure, expanded crop insurance, and relief allocations better matched to district-level damage [3]

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—would protect the asset base that keeps North Bihar poor.

B. **Agro-Processing and Value Addition:** North Bihar's fertility is under-monetised. Investment in makhana, litchi, maize, dairy and food-processing clusters, with cold chains and market linkages, could capture value locally rather than exporting raw produce [7], [9].

C. **Industrial Dispersal Beyond Patna and Barauni:** The Begusarai model shows that targeted industrial anchoring works. Extending BIADA-led industrial areas, textile and leather policy incentives, and logistics corridors to northern districts (Darbhanga, Purnia, Muzaffarpur) could seed secondary-sector growth [9], [11].

D. **Human-Capital Investment in Deprived Districts:** Given severe stunting and low female literacy, convergent spending on nutrition, schooling and primary health in the poorest districts is both an equity and a productivity measure [6], [12].

E. **Data-Driven, District-Targeted Fiscal Transfers:** Using per-capita GDDP and MPI rankings to weight state development spending toward the bottom districts would directly attack the disparity [1], [6].

VII. CONCLUSION

The descriptive evidence consistently points to a substantial North–South development differential. Still, journal-level inference should distinguish the raw regional gap from differences generated by district composition and influential outliers. Patna strongly drives South Bihar's observed advantage, while Begusarai shows that industrial agglomeration can offset disadvantages associated with a northern location. Mean/median tests, dispersion measures, and multivariate specifications provide a transparent way to determine whether a regional differential remains after accounting for these features. This reframing shifts the interpretation from a simple geographical divide to competing mechanisms involving agglomeration, structural transformation, infrastructure, human capital and environmental vulnerability.

DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

- **Conflicts of Interest/ Competing Interests:** Based on my understanding, this article has no conflicts of interest.
- **Funding Support:** This article has not been funded by any organizations or agencies. This independence ensures that the research is conducted objectively and free from external influence.
- **Ethical Approval and Consent to Participate:** The content of this article does not necessitate ethical approval or consent to participate with supporting documentation.
- **Data Access Statement and Material Availability:** The data and materials in this article are publicly accessible.
- **Author's Contributions:** The authorship of this article is contributed solely.

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Appendix A

Recommended Variables for the Empirical Dataset

Table III: Recommended Variables, Operational Definitions and Sources

Variable	Operational Definition	Expected Sign	Primary Source
Per-capita GDDP	District GDDP per person, constant prices	Dependent	Bihar Economic Survey / DES [1]
North	1 = North Bihar; 0 = South Bihar	Empirical	Author classification
Industrialisation	Secondary-sector share or industrial proxy	+	DES / Bihar Economic Survey [1]
Infrastructure	Electricity/road/connectivity indicator or index	+	Bihar Economic Survey [1]
Human capital	Literacy/schooling or composite indicator	+	Official statistics / NITI Aayog [6], [12]
Poverty	Income poverty or MPI measure	−	Caste-Based Survey / NITI Aayog [5], [6]
Flood exposure	Flood-affected area/frequency/intensity proxy	−	Disaster Management Department, GoB [3], [8]

Source: Author's specification.

Appendix B

Recommended Empirical Outputs

To keep the numbering of the paper's own tables distinct, the outputs proposed for the full empirical exercise are labelled R1–R6:

- **Output R1 (table):** Descriptive statistics for all 38 districts, separately for North and South Bihar.
- **Output R2 (table):** Difference-in-means and difference-in-medians tests for per-capita GDDP and core indicators.
- **Output R3 (table):** Cross-sectional OLS estimates of Equation (3) with heteroskedasticity-robust standard errors.
- **Output R4 (table):** Robustness checks excluding Patna and excluding Patna plus Begusarai.
- **Output R5 (figure):** District-wise per-capita GDDP distribution by region.
- **Output R6 (figure):** Ranked or mapped spatial distribution of district-level economic status.

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