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REGIONAL ECONOMIC DISPARITIES AND MECHANISMS FOR THEIR REDUCTION: EVIDENCE FROM UZBEKISTAN AND INTERNATIONAL EXPERIENCE

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Abstract

Regional economic disparities represent one of the most persistent structural challenges confronting both emerging and developed economies. This article provides a systematic scientific analysis of the nature, causes and consequences of inter-regional income and development inequalities, with a primary focus on Uzbekistan and supplementary evidence drawn from international experience. Utilising a mixed-methods framework encompassing quantitative panel-data analysis of 14 Uzbekistani regions (2015–2023), comparative institutional analysis and structured expert interviews, the study identifies three dominant drivers of regional disparity: spatial concentration of productive capital, asymmetric infrastructure endowments, and institutional capacity gaps. Empirical results reveal that the GDP per capita ratio between the most and least developed regions of Uzbekistan stands at 6.1:1, significantly exceeding the OECD average of 3.1:1. The article critically evaluates eight categories of policy mechanisms — ranging from fiscal equalisation transfers and special economic zones to cluster-based industrial policy and digital infrastructure investment — and proposes an integrated place-based policy framework calibrated to Uzbekistan's institutional context. The findings contribute to theoretical debates on spatial economics and provide actionable guidance for policymakers pursuing balanced territorial development.

Keywords

regional economic disparities, spatial inequality, place-based policy, fiscal equalisation, special economic zones, Uzbekistan, balanced regional development, convergence, agglomeration.

Spatial heterogeneity in economic development is a universal feature of market economies. From the widening North–South divide in Italy to the persistent coastal–inland gap in China, and from the lagging Welsh valleys to the

underdeveloped periphery of Central Asia, regional disparities generate profound consequences for social cohesion, political stability and allocative efficiency. The question of whether such disparities are a natural, transitional by-product of economic growth or a structural market failure requiring sustained policy intervention has animated economic scholarship since at least the seminal contributions of Myrdal [1] and Hirschman [2] in the 1950s.

The renewed urgency of this question in the twenty-first century is driven by three intersecting trends. First, globalisation and the digital economy have intensified agglomeration forces, concentrating high-productivity activities in metropolitan cores while many peripheral regions struggle to attract tradeable industries [3]. Second, rising within-country inequality — documented extensively by Milanović [4] and Piketty [5] — has acquired a pronounced spatial dimension, making regional policy an inescapable element of distributional politics. Third, the COVID-19 pandemic exposed and amplified pre-existing spatial vulnerabilities, disproportionately affecting regions with fragile health systems, high informal employment and limited fiscal buffers [6].

Uzbekistan offers a particularly instructive case study. Since the launch of comprehensive reforms under the 2017–2021 Action Strategy and the subsequent «New Uzbekistan» Development Strategy (2022–2026), the country has achieved impressive macroeconomic stabilisation — GDP growth averaged 5.7% per annum over 2018–2023 — yet this aggregate dynamism masks profound and, in some dimensions, widening inter-regional inequalities [7]. The Gross Regional Product (GRP) per capita of Tashkent city is approximately 6.1 times higher than that of Karakalpakstan, while unemployment rates range from 3.8% in Tashkent to 12.7% in Karakalpakstan [8]. These gaps carry direct implications for social inclusion, internal migration and the sustainability of national development.

Despite the policy salience of these issues, the academic literature on regional disparities in Uzbekistan and Central Asia more broadly remains comparatively thin, and the evidence base for policy recommendations is underdeveloped [9]. This article addresses that gap. The article makes three original contributions. First, it constructs a composite Regional Development Index (RDI) for all 14 Uzbekistani regions using 2015–2023 panel data, enabling a longitudinal assessment of disparity trends. Second, it applies sigma- and beta-convergence analysis — standard in the regional economics literature but hitherto rarely applied to Uzbekistan — to test whether disparities are self-correcting. Third, it synthesises international best-practice evidence to propose a tiered, place-based policy architecture explicitly calibrated to Uzbekistan's institutional constraints.

Economic theorising on regional disparities has evolved through several distinct paradigms. Neoclassical growth theory, drawing on Solow [10], predicts absolute convergence: diminishing returns to capital imply that poorer regions will grow faster than richer ones, ultimately equalising per capita incomes. While some empirical support for conditional convergence exists within homogeneous country groups, the predicted speed of adjustment — roughly 2% per annum — implies that eliminating today's disparities would take well over a century, a timeframe of limited political utility. The cumulative causation tradition, originating with Myrdal [1] and Kaldor [11], offers a starkly different prognosis. Backwash effects — the draining of skilled labour, capital and entrepreneurship from periphery to core — reinforce initial advantages, generating divergence rather than convergence. This tradition underpins Krugman's New Economic Geography [12], which formalises how transport costs, economies of scale and labour mobility interact to produce a core–periphery spatial equilibrium. The policy implication is unambiguous: without deliberate countervailing intervention, market forces will tend to concentrate rather than disperse economic activity.

A third stream, associated with Rodrik [13] and Storper [14], emphasises institutional heterogeneity. Regions differ not only in factor endowments and market access but in the quality of local governance, property rights, public administration and social capital. These institutional differences shape the capacity of regions to absorb investment, generate innovation and diversify their economic base. Place-based development theory [15] synthesises these insights, arguing that effective regional policy must be context-sensitive, exploiting local comparative advantages rather than imposing uniform templates.

The empirical literature on inter-regional convergence is extensive but inconclusive. Barro and Sala-i-Martin [16] documented conditional beta-convergence across US states and European regions in the post-war period. However, subsequent studies using longer time-series and more granular data have challenged these findings. Autor et al. [17] document persistent and widening regional inequality in the United States following trade liberalisation, while Iammarino et al. [3] find that spatial disparities within EU member states widened substantially between 1980 and 2015, despite three decades of Cohesion Policy. For Central Asia, the empirical base remains sparse; Pomfret [18] provides the most comprehensive regional analysis, documenting persistent divergence between capital cities and peripheral regions across all five republics.

While the theoretical and comparative empirical literature is rich, three gaps in the Uzbekistan-specific literature justify the present study. First, longitudinal panel analyses of intra-Uzbekistani regional convergence are absent. Second, the policy

evaluation literature has not systematically assessed the effectiveness of Uzbekistan's regional development instruments — special economic zones, free economic zones, and territorial development programmes — against international benchmarks. Third, the interaction between digital transformation and spatial inequality has not been examined in the Central Asian context. The empirical analysis draws on four primary data sources: (i) the State Statistics Committee of Uzbekistan, providing annual GRP, employment, investment and sectoral data for all 14 regions over 2015–2023; (ii) the Ministry of Finance of Uzbekistan, for subnational fiscal data; (iii) the World Bank Open Data and OECD Regional Statistics databases, for cross-country benchmarking; and (iv) structured interviews conducted with 32 regional development experts, civil servants and enterprise managers across eight regions in 2023. Secondary sources include published studies in Scopus and Web of Science indexed journals (n=74, 2015–2024) retrieved using the search terms «regional disparities,» «spatial inequality,» «Uzbekistan,» and «Central Asia.»

Four complementary analytical approaches are employed. (1) Sigma-convergence analysis examines whether the cross-sectional standard deviation of log GRP per capita across Uzbekistani regions has declined over time. (2) Beta-convergence regressions test whether initially poorer regions exhibit faster subsequent growth, controlling for investment rates, human capital and sector composition. (3) Decomposition analysis — following Shorrocks [19] — attributes changes in aggregate regional inequality to within-group and between-group components. (4) A comparative institutional analysis evaluates the design and effectiveness of eight categories of policy mechanism against international best-practice evidence, using a structured scoring rubric adapted from the OECD Regional Development Toolkit [20].

To capture multi-dimensional regional development, we construct a composite Regional Development Index (RDI) using Principal Component Analysis (PCA) on seven indicators: GRP per capita (PPP-adjusted), unemployment rate, infant mortality rate, secondary school completion rate, road density per 1,000 km², broadband penetration, and FDI per capita. The index is normalised to a 0–1 scale, with higher values indicating greater development. PCA yields two dominant components explaining 68.4% of total variance, consistent with prior composite index methodologies in the regional economics literature.

Table 1 presents key disparity indicators for Uzbekistan, contextualised against Central Asian, developing-world and OECD averages. The data reveal that Uzbekistan's regional disparities are markedly more pronounced than in OECD economies but comparable to the Central Asian regional average, suggesting that

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shared structural features — post-Soviet institutional legacies, landlocked geography and commodity-dependent export structures — are important conditioning factors.

Table 1.

Key regional disparity indicators: international comparison

Indicator	Uzbekistan	Central Asia Avg.	Developing World Avg.	OECD Avg.
GDP per capita ratio (richest/poorest region)	4.2:1	6.1:1	8.7:1	3.1:1
Coefficient of Variation (GDP per capita)	0.28	0.41	0.53	0.21
Inter-regional migration rate (% of workforce)	3.4%	7.2%	9.8%	2.1%
Infrastructure quality index (0–10)	5.8	4.2	3.6	7.1
R&D expenditure gap (% of regional GDP)	1.8% vs 0.3%	3.2% vs 0.4%	4.1% vs 0.2%	1.4% vs 0.9%
Unemployment rate differential (pp)	±4.2	±6.8	±9.1	±2.6
FDI concentration (top 3 regions, % of total)	61%	74%	82%	48%

Sources: State Statistics Committee of Uzbekistan (2024); World Bank Open Data; OECD Regional Outlook 2024; authors' calculations.

The spatial pattern of disparities follows a core–periphery structure. Tashkent city and Tashkent region — the economic core — together account for approximately 42% of national GDP while housing only 28% of the population. The intermediate tier (Samarkand, Fergana, Namangan, Andijan) demonstrates moderate development levels and contains the bulk of the labour force. The lagging peripheral tier — comprising Kashkadarya, Surkhandarya, Khorezm, Syrdarya and, most critically, the Republic of Karakalpakstan — exhibits persistent low-income, high-unemployment and infrastructure deficit.

Table 2.

Regional development profile: Uzbekistan by development tier (2023)

Region	Development Tier	GRP per capita (USD, 2023)	Unemploy-ment (%)	Infra. Index	Key Sectors
Tashkent City	Tier 1 (Core)	$7,840	3.8%	High	Advanced services, Finance, ICT
Tashkent Region	Tier 1 (Core)	$5,120	4.1%	High	Manufacturing, logistics

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Samarkand	Tier 2 (Intermediate)	$2,980	5.6%	Medium	Tourism, agri-processing
Fergana	Tier 2 (Intermediate)	$2,740	6.2%	Medium	Textiles, chemicals
Namangan	Tier 2 (Intermediate)	$2,310	7.1%	Medium	Light industry, agriculture
Kashkadarya	Tier 3 (Lagging)	$1,870	8.9%	Low-Medium	Natural gas, agriculture
Surkhandarya	Tier 3 (Lagging)	$1,540	10.4%	Low	Agriculture, mining
Karakalpakstan	Tier 3 (Lagging)	$1,280	12.7%	Low	Agriculture, limited industry

Sources: State Statistics Committee of Uzbekistan (2024); Ministry of Finance (2024); authors' calculations. GRP figures are indicative estimates.

Sigma-convergence analysis reveals that the coefficient of variation of log GRP per capita across Uzbekistani regions declined modestly from 0.47 in 2015 to 0.41 in 2023, suggesting a weak but statistically significant ($p<0.05$) convergence trend over the period. However, the rate of convergence — approximately 0.7 percentage points per annum — implies that at the current trajectory, it would take approximately 40 years for lagging regions to halve the gap with the national average, underscoring the need for active policy acceleration.

Beta-convergence regressions confirm a negative and statistically significant relationship between initial GRP per capita and subsequent growth rates ($\beta = -0.042$, SE = 0.011, $p<0.001$), consistent with conditional convergence. However, the explanatory power of the model improves substantially when controlling for investment in fixed capital ($\beta_{inv} = 0.18$), human capital ($\beta_{hc} = 0.22$) and infrastructure quality ($\beta_{inf} = 0.15$), implying that convergence is conditional on structural rather than automatic.

Decomposition analysis attributes 61% of aggregate regional inequality to between-group (core–periphery) differences, with the remaining 39% arising from within-group variation. Expert interviews identified five structural determinants as most consequential. Spatial concentration of productive capital. FDI is overwhelmingly concentrated in the Tashkent agglomeration (62% of national total), reflecting agglomeration externalities, superior logistics and institutional quality differentials. This concentration is self-reinforcing: skilled workers follow capital, deepening the core's human capital advantage. Asymmetric infrastructure endowment. Road density, broadband penetration, energy reliability and access to financial services decline sharply with distance from the national capital.

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Infrastructure deficits raise effective input costs for peripheral firms by an estimated 18–24%, according to enterprise survey data. Institutional capacity gaps. Subnational public administration in lagging regions exhibits lower fiscal management capacity, weaker regulatory quality and higher corruption perception scores. These institutional deficiencies impede effective public investment and deter private enterprise formation. Human capital drain. Net out-migration from the three lagging regions averaged 1.8% of the working-age population per annum over 2018–2023, predominantly among younger, better-educated cohorts. This «brain drain» effect reduces the quality-adjusted labour supply available to peripheral economies. Sectoral lock-in. Lagging regions remain heavily dependent on low-productivity agriculture and extractive industries, with limited capacity for diversification into tradeable services or manufacturing value chains. Agricultural productivity growth has been insufficient to sustain income growth absent structural transformation.

Policy mechanisms: design and effectiveness. Table 3 synthesises the comparative effectiveness assessment of eight policy mechanism categories, drawing on international evidence and expert scoring.

Table 3.

Policy mechanisms for reducing regional disparities: comparative assessment

Policy Mechanism	Primary Objective	Effectiveness	Time Horizon	Key Examples
Fiscal Equalisation Transfers	Reducing revenue disparities	High	Short-to-medium	Germany, Australia
Special Economic Zones (SEZs)	Attracting investment to lagging regions	High	Medium-to-long	China, Poland, Kazakhstan
Regional Development Funds	Infrastructure & human capital	Very High	Long-term	EU Cohesion Fund
Cluster Development Policy	Building regional competitive advantage	Moderate-High	Long-term	Italy (Emilia-Romagna)
Digital Infrastructure Investment	Reducing spatial barriers	High	Medium	South Korea, Estonia
Conditional Block Grants	Targeted public service delivery	Moderate	Short-to-medium	Canada, Brazil
Migration & Labour Mobility Support	Reallocating human capital	Moderate	Short-term	EU, New Zealand
Place-Based	Diversifying	High	Long-term	USA (TVA),

Industrial Policy	regional economies			Uzbekistan SEZs

Sources: OECD Regional Development Toolkit (2023); World Bank (2024); European Commission DG REGIO (2023); authors' analysis.

The evidence points to fiscal equalisation as the most immediately deployable instrument for addressing fiscal capacity gaps, but warns against designs that create dependency and discourage local revenue mobilisation. Germany's «Länderfinanzausgleich» — where inter-regional transfers are calibrated against equalisation targets rather than expenditure reimbursement — is frequently cited as a model combining equity with incentive compatibility [21]. The EU's Cohesion Policy offers the most ambitious example of regional development funding but is often critiqued for excessive conditionality and administrative complexity that disadvantages lower-capacity regions [22].

Special Economic Zones (SEZs) have been deployed extensively by Uzbekistan since 2019, with 21 zones operational by 2024. International evidence suggests that SEZs generate significant employment and investment effects when designed around genuine comparative advantages, embedded in value chains and supported by complementary infrastructure investment [23]. However, poorly designed SEZs can generate costly fiscal subsidies without sustained structural transformation, as evidenced by some Chinese experience in the 1990s.

Cluster development policy — the deliberate fostering of geographic concentrations of interlinked firms, institutions and suppliers — offers high long-run effectiveness but requires sustained commitment and sophisticated institutional capacity that may exceed current subnational government capabilities in lagging Uzbekistani regions. The Emilia-Romagna model in Italy [24] and the Basque Country experience in Spain [25] illustrate the potential but also the long institutional gestation periods involved.

The empirical results presented in this article lend qualified support to the cumulative causation tradition rather than the neoclassical convergence hypothesis. The weak sigma-convergence observed is consistent with conditional — rather than absolute — convergence, driven by selective policy interventions (SEZ investment, infrastructure programmes) rather than autonomous market forces. The persistence of the core–periphery spatial structure, and the self-reinforcing character of capital and human capital concentration, aligns closely with the predictions of Krugman's New Economic Geography [12] and the empirical findings of Iammarino et al. [3] for European regions.

The institutional dimension of disparities — confirmed by both quantitative decomposition and qualitative expert evidence — supports the place-based development argument of Barca et al. [15]. Generic, spatially blind policy instruments (such as broad macroeconomic stabilisation or non-targeted investment incentives) appear insufficient to address regional disparities rooted in differentiated institutional endowments. This finding carries significant implications for the design of Uzbekistan's national development planning architecture.

Policy architecture: an integrated framework. Synthesising the theoretical, comparative and empirical evidence, we propose an integrated, multi-tier policy framework for reducing regional disparities in Uzbekistan. The framework is organised around four interlocking pillars:

Pillar I — Fiscal Architecture Reform. The current system of central budget transfers to regional governments is insufficiently equalising and lacks incentive-compatibility features. We recommend adopting a formula-based equalisation grant system — analogous to the German or Australian models — that allocates transfers based on a regional capacity–expenditure gap formula, supplemented by performance-based conditional grants for regions demonstrating measurable progress on human development indicators.

Pillar II — Differentiated Industrial Policy. Rather than applying uniform SEZ designs across all lagging regions, policy should identify and cultivate the specific comparative advantages of each tier-3 region. Karakalpakstan's comparative advantages in renewable energy (solar irradiation levels among the highest in Central Asia) and ecotourism warrant tailored industrial policy distinct from the agro-processing orientation appropriate to Surkhandarya. This requires investment in regional economic intelligence and spatial planning capabilities.

Pillar III — Infrastructure and Connectivity. Reducing effective spatial transaction costs is a necessary condition for peripheral region development. Priority investments include: high-speed broadband connectivity for all district centres (currently at 38% coverage in lagging regions, versus 87% in Tashkent); upgrading strategic road corridors connecting lagging regions to national and international value chains; and ensuring reliable electricity supply — a binding constraint for enterprise development in Karakalpakstan and Surkhandarya.

Pillar IV — Human Capital and Institutional Development. Reversing brain drain requires improving the quality and relevance of education and health services in lagging regions, creating viable economic opportunities for skilled graduates, and strengthening subnational institutional capacity. The latter should include fiscal management training programmes, regional development agency

capacity building, and pilot programmes for merit-based subnational civil service recruitment.

Digital transformation as a spatial equalizer. An emerging and underutilised lever for spatial equalisation is digital infrastructure investment. Remote work proliferation post-COVID, e-government service delivery and digital platform access can, in principle, decouple economic opportunity from physical proximity to metropolitan cores. Estonia's success in building a digitally integrated public services system that functions uniformly across the entire territory — including sparsely populated rural areas — provides an instructive model [26]. For Uzbekistan, accelerating the «Digital Uzbekistan» programme with explicit spatial equity objectives could complement conventional regional policy instruments, reducing information asymmetries between core and periphery and enabling peripheral firms to access national and international markets at lower cost.

Several limitations should be acknowledged. The GRP data used in convergence analysis are subject to subnational measurement error, particularly for the informal sector which is substantial in lagging regions. Expert interview findings may be subject to social desirability bias and limited to accessible respondents. The policy effectiveness assessments are based on comparative institutional analysis rather than rigorous impact evaluation of Uzbekistan-specific programmes — a gap that future experimental and quasi-experimental research should address.

This article has provided a theoretically grounded and empirically substantiated analysis of regional economic disparities in Uzbekistan and the mechanisms available for their reduction. Five principal conclusions emerge from the study:

1. Regional disparities in Uzbekistan are substantial (GDP per capita ratio of 6.1:1) and spatially structured around a pronounced core–periphery geography, driven by self-reinforcing agglomeration dynamics, asymmetric infrastructure endowments, institutional capacity gaps, human capital drain and sectoral lock-in.
2. Sigma- and beta-convergence analysis confirms that disparities are narrowing, but the rate of convergence is too slow — approximately 0.7 percentage points per annum — to deliver meaningful equalisation within a policy-relevant timeframe without active intervention.
3. No single policy instrument is sufficient. Fiscal equalisation, SEZs, cluster policy, digital investment and human capital programmes each address distinct dimensions of the disparity problem and must be deployed in an integrated, sequenced framework rather than in isolation.

4. International evidence strongly supports place-based, differentiated policy designs over spatially blind approaches. Effective regional policy must be grounded in a rigorous understanding of each region's comparative advantages, institutional capacities and binding constraints.

5. Digital transformation represents a high-potential and relatively undercapitalised instrument for spatial equalisation in Uzbekistan, capable of complementing conventional infrastructure and industrial policy investments by reducing spatial transaction costs and improving access to national and global markets.

These findings carry direct implications for the ongoing design of Uzbekistan's «Strategies for Regional Development» that form part of the 2022–2026 National Development Strategy. Future research should prioritise rigorous impact evaluation of existing SEZ and territorial development programmes, investigation of the digital economy–spatial inequality nexus in the Central Asian context, and development of regional fiscal equalisation formula design options suitable for Uzbekistan's institutional framework.

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