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POLICY INSTRUMENTS FOR REDUCING REGIONAL INCOME INEQUALITY IN UZBEKISTAN: EVIDENCE FROM PANEL AND SPATIAL ECONOMETRIC ANALYSIS

Muhammadkhon Muydinov
Fergana State University, Doctoral Researcher

Abstract

Regional income inequality remains a persistent challenge in Uzbekistan despite recent economic growth and structural reforms. Significant disparities between regions undermine inclusive development, social cohesion, and long-term economic sustainability. This study examines the effectiveness of key policy instruments aimed at reducing regional income inequality in Uzbekistan using panel and spatial econometric methods. Based on regional data covering the period 2010–2023, the analysis evaluates the impact of fiscal transfers, infrastructure investment, human capital development, and entrepreneurship support on interregional income disparities. Fixed-effects panel regression and spatial autoregressive models reveal that infrastructure investment and human capital expenditures exert a statistically significant equalizing effect on regional incomes, while fiscal transfers primarily mitigate short-term imbalances without fostering long-term convergence. The findings suggest that development-oriented and spatially targeted policy instruments are more effective than compensatory mechanisms. The study contributes to the literature on regional inequality in transition economies and provides policy-relevant insights for balanced territorial development in Uzbekistan.

Keywords: Regional income inequality, policy instruments, panel data, spatial econometrics, Uzbekistan

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Introduction

Regional income inequality has emerged as one of the most persistent and structurally embedded challenges confronting contemporary economic development, particularly in transition and developing economies. While national-level growth indicators often suggest overall economic progress, such aggregate measures frequently conceal profound disparities in income distribution across regions. These territorial imbalances not only reflect uneven economic opportunities but also reinforce long-term structural inequality, social stratification, and spatial exclusion.

In the context of Uzbekistan, regional income inequality has become increasingly salient during the post-reform period. Since the mid-2010s, the country has implemented wide-ranging market-oriented reforms aimed at liberalizing prices, stimulating private entrepreneurship, attracting foreign investment, and modernizing infrastructure. Although these reforms have accelerated economic growth, their spatial outcomes have been asymmetric. Regions with favorable geographic location, industrial concentration, and administrative capacity—most notably Tashkent city and adjacent areas—have benefited disproportionately, while peripheral and agrarian regions continue to lag behind in income levels, employment quality, and access to productive resources.

Persistent regional income disparities pose serious risks to inclusive development. First, they undermine social cohesion by reinforcing unequal living standards and limiting upward mobility in lagging regions. Second, they generate inefficient migration patterns, including excessive rural-to-urban migration and regional brain drain, which further weaken local development potential. Third, pronounced regional inequality constrains national growth by underutilizing human and economic resources in disadvantaged territories. For these reasons, reducing regional income inequality is not merely a redistributive concern but a fundamental prerequisite for sustainable and balanced economic development.

Recognizing these challenges, the government of Uzbekistan has identified regional development and poverty reduction as strategic policy priorities. A broad set of policy instruments has been deployed, including intergovernmental

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fiscal transfers, targeted infrastructure investments, human capital development programs, support for small and medium-sized enterprises (SMEs), and the establishment of special economic zones. These instruments are designed to stimulate regional growth, enhance employment opportunities, and narrow income gaps between regions. However, the effectiveness of these policies in achieving income convergence remains an open empirical question.

Existing research on regional inequality in Uzbekistan and comparable transition economies often relies on descriptive analysis or national-level indicators, offering limited insight into the causal impact of specific policy instruments. Moreover, many studies overlook the spatial interdependence of regions, despite growing evidence that economic outcomes in one region are influenced by developments in neighboring territories. Ignoring such spatial spillovers may lead to biased estimates and incomplete policy conclusions.

Against this background, the present study seeks to provide a comprehensive empirical assessment of policy instruments aimed at reducing regional income inequality in Uzbekistan. By employing panel data techniques alongside spatial econometric models, the study captures both temporal dynamics and spatial interactions among regions. This approach allows for a more nuanced evaluation of how fiscal, infrastructural, human capital, and entrepreneurship-related policies influence regional income levels and inequality patterns.

The contribution of this study is threefold. First, it enriches the limited empirical literature on regional income inequality in Uzbekistan by applying rigorous econometric methods to regional-level data. Second, it integrates spatial analysis into the evaluation of policy instruments, highlighting the role of interregional spillover effects. Third, it provides evidence-based policy implications that can inform the design of development-oriented and spatially targeted regional policies.

The remainder of the paper is structured as follows. Section 2 reviews the relevant theoretical and empirical literature. Section 3 describes the data and methodology. Section 4 presents the empirical results of panel and spatial econometric models. Section 5 discusses the findings in the context of regional development policy. Section 6 concludes with policy recommendations and directions for future research.

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2. Literature Review

The study of regional income inequality is rooted in several major theoretical traditions within economics and regional science. Neoclassical growth theory predicts that regional income disparities should diminish over time as capital flows toward less-developed regions and labor migrates toward higher-productivity areas, leading to convergence in income levels (Solow, 1956; Barro & Sala-i-Martin, 2004). According to this perspective, market forces alone are sufficient to equalize regional incomes in the long run.

However, empirical evidence has frequently contradicted this optimistic prediction, particularly in developing and transition economies. New economic geography and endogenous growth theories argue that increasing returns to scale, agglomeration economies, and cumulative causation mechanisms may instead lead to persistent or even widening regional disparities (Krugman, 1991; Fujita, Krugman, & Venables, 1999). Regions with initial advantages—such as infrastructure, human capital, or market access—attract more investment and skilled labor, reinforcing their dominance over time.

Institutional and structural approaches further emphasize the role of governance quality, historical specialization, and policy frameworks in shaping regional inequality. From this perspective, regional income stratification is not a temporary imbalance but a structural outcome of uneven institutional capacity, public investment, and policy effectiveness (Rodríguez-Pose, 2013).

A substantial body of literature examines the role of public policy in mitigating regional income inequality. Fiscal policy, particularly intergovernmental transfers, is often regarded as the primary equalization instrument. Studies in OECD and EU countries suggest that fiscal transfers can reduce short-term income disparities but may weaken incentives for regional productivity growth if not properly designed (OECD, 2018; Boadway & Shah, 2009).

Infrastructure investment has been identified as one of the most effective long-term tools for reducing regional inequality. Improved transport, energy, and digital infrastructure enhance market access, reduce transaction costs, and stimulate private investment in lagging regions (World Bank, 2009). Empirical studies consistently find positive effects of infrastructure spending on regional

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income convergence, particularly when investments are spatially coordinated (Calderón & Servén, 2014).

Human capital development is another central policy instrument. Becker's (1993) human capital theory highlights education and skills as key drivers of income growth. Regional studies demonstrate that disparities in education quality and access contribute significantly to income inequality, especially in regions with limited labor mobility (Moretti, 2011). Targeted education and vocational training programs have been shown to generate strong equalizing effects over the long term.

Entrepreneurship and SME support policies are increasingly emphasized in regional development strategies. Small and medium-sized enterprises play a critical role in job creation and income generation in peripheral regions; however, access to finance, markets, and institutional support often remains uneven (Audretsch & Keilbach, 2004). Empirical evidence suggests that entrepreneurship policies reduce regional income inequality when complemented by strong local institutions.

Recent advances in regional economics highlight the importance of spatial dependence in income dynamics. Traditional econometric models that ignore spatial interactions may underestimate or misinterpret policy effects. Spatial econometric studies demonstrate that income growth and inequality in one region are influenced by economic conditions and policies in neighboring regions through labor mobility, trade linkages, and infrastructure networks (Anselin, 1988; LeSage & Pace, 2009).

Empirical research using spatial autoregressive and spatial Durbin models finds significant spillover effects of infrastructure investment, industrial development, and education spending across regions. These findings suggest that policy interventions can generate multiplier effects beyond administrative boundaries, strengthening the case for coordinated regional strategies rather than isolated local interventions.

Transition economies present a distinct context for studying regional income inequality. The collapse of centrally planned systems led to profound structural changes, including industrial restructuring, privatization, and decentralization. Numerous studies document that these processes initially increased regional

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disparities, particularly between capital regions and peripheral areas (Fedorov, 2002; World Bank, 2012).

In Central Asia, regional inequality is shaped by historical production specialization, uneven resource endowments, and varying degrees of integration into global markets. Research on post-Soviet countries highlights the persistence of spatial inequality due to limited institutional capacity at the regional level and uneven reform implementation (Bradshaw & Vartapetov, 2003).

Uzbekistan shares many of these structural characteristics but remains underrepresented in international empirical literature. Existing studies on Uzbekistan primarily focus on poverty reduction, national income distribution, or sectoral reforms, with limited attention to interregional income inequality and policy effectiveness at the regional level. Moreover, few studies employ advanced econometric or spatial me2.5 Research Gap and Contribution

Despite extensive international literature on regional income inequality, several gaps remain relevant to the Uzbek context. First, there is a lack of empirical studies that systematically evaluate the effectiveness of multiple policy instruments simultaneously. Second, spatial interdependence among regions is rarely incorporated into empirical models, despite its relevance for geographically contiguous regions. Third, transition economies like Uzbekistan require context-specific analysis that accounts for institutional and structural constraints.

This study addresses these gaps by applying panel and spatial econometric methods to regional data from Uzbekistan, providing a comprehensive assessment of how policy instruments influence regional income inequality. By integrating spatial spillover effects and policy evaluation, the study contributes to both the academic literature and evidence-based policymaking.thods, leaving a significant methodological gap.

Data and Methodology

1. Data Sources:

The study uses balanced panel data for Uzbekistan's regions covering 2010–2023, obtained from:

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- State Statistics Committee of the Republic of Uzbekistan
- National development and budget reports
- World Bank and UNDP statistical databases

2. Variables

Dependent variable:
Regional average household income (log-transformed)
Independent variables (policy instruments):
Fiscal transfers per capita
Infrastructure investment per capita
Education and human capital expenditure
SME density (number of SMEs per 1,000 population)
Control variables:
Employment rate, urbanization level.

3. Panel econometric model

Panel econometric methods are particularly appropriate for the analysis of regional income inequality because they allow the simultaneous examination of differences across regions and changes over time. In the case of Uzbekistan, regional income levels are shaped not only by short-term policy interventions but also by persistent structural characteristics such as geographic location, historical specialization, institutional capacity, and inherited infrastructure. Panel data analysis makes it possible to control for these unobserved, time-invariant regional characteristics, thereby reducing the risk of biased estimates and improving the reliability of policy evaluation.

The empirical analysis in this study employs a fixed effects panel regression framework. This approach assumes that each region possesses unique, time-invariant characteristics that may influence income levels and may also be correlated with policy variables such as infrastructure investment, fiscal transfers, or human capital expenditures. By allowing each region to have its own intercept, the fixed effects model effectively isolates the impact of policy instruments from these unobserved regional traits. This feature is particularly

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important in the Uzbek context, where regional differences in administrative capacity, economic structure, and development history are substantial and cannot be directly measured.

The dependent variable in the model is the logarithm of average household income, which enables interpretation of the estimated coefficients as percentage changes and helps to stabilize variance across regions. The key explanatory variables represent major policy instruments aimed at reducing regional inequality, including per capita fiscal transfers, infrastructure investment, expenditures on education and human capital, and indicators of entrepreneurial activity measured through small and medium-sized enterprise density. Additional control variables are included to account for labor market conditions and the degree of urbanization, which are known to influence regional income dynamics.

A crucial methodological consideration in panel data analysis is the choice between fixed effects and random effects estimators. In this study, the fixed effects specification is preferred because it is highly plausible that unobserved regional characteristics are correlated with the explanatory variables. For example, regions with better governance or strategic location may receive higher levels of public investment while simultaneously exhibiting higher income levels. Statistical testing supports this choice, as specification tests reject the assumption underlying the random effects model. Consequently, the fixed effects estimator provides more consistent and credible results for the purpose of policy evaluation.

Potential econometric issues such as heteroskedasticity and serial correlation are addressed by employing robust standard errors clustered at the regional level. This ensures that statistical inference remains valid even when error terms are correlated within regions over time. Although concerns regarding endogeneity cannot be entirely eliminated, the use of lagged policy variables and alternative model specifications helps to mitigate reverse causality and strengthens the interpretability of the results.

Overall, the panel econometric approach adopted in this study provides a rigorous and flexible framework for assessing the effectiveness of policy instruments aimed at reducing regional income inequality in Uzbekistan. By

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controlling for unobserved heterogeneity and capturing both temporal and cross-sectional variation, the model allows for a clearer understanding of how different policy measures influence regional income dynamics. This methodological strategy enhances the relevance of the empirical findings for evidence-based regional development policy.

A fixed-effects panel model is specified as:

$$\ln(Income_{it}) = \alpha_I + \beta_1 Transfers_{it} + \beta_2 Infrastructure_{it} + \beta_3 HumanCapital_{it} + \beta_4 SME_{it} + \varepsilon_{it}$$

This model controls for unobserved regional heterogeneity.

4. Spatial econometric model

Spatial econometric methods are employed in this study to capture the geographic interdependence of regional income dynamics in Uzbekistan. Regional economies do not evolve in isolation; rather, income levels, investment patterns, and labor market outcomes in one region are often influenced by developments in neighboring territories. Ignoring such spatial interactions may lead to biased or incomplete estimates of policy effectiveness, particularly in countries where regions are closely connected through migration flows, transport networks, and production linkages.

In the context of Uzbekistan, spatial dependence is especially relevant due to the concentration of economic activity in a limited number of growth centers and the strong functional ties between adjacent regions. Infrastructure projects, industrial development, and public investment implemented in one region may generate spillover effects that extend beyond administrative borders. As a result, regional income inequality cannot be fully understood without accounting for these spatial linkages.

To address this issue, the empirical analysis incorporates a spatial econometric framework that explicitly models interregional interactions. The spatial model introduces a spatially lagged dependent variable, which captures the influence of income levels in neighboring regions on the income level of a given region. This specification allows the analysis to identify whether regional income

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growth exhibits spatial clustering and whether policy interventions generate indirect effects across regions.

Spatial relationships among regions are defined using a contiguity-based spatial weights matrix, which assigns higher weights to geographically adjacent regions. This approach reflects the assumption that neighboring regions are more likely to influence each other through labor mobility, trade, shared infrastructure, and institutional interaction. The spatial weights matrix is standardized to ensure comparability across regions and to facilitate interpretation of the estimated coefficients.

The inclusion of spatial dependence enables the model to distinguish between direct effects of policy instruments within a region and indirect spillover effects originating from neighboring regions. For example, infrastructure investment in one region may increase local income levels while simultaneously improving market access and employment opportunities in adjacent regions. Such spillovers strengthen the overall equalizing effect of development-oriented policies and underscore the importance of spatial coordination in regional development strategies.

Empirical results from the spatial econometric model indicate a statistically significant spatial dependence in regional income levels, confirming that income disparities in Uzbekistan are geographically clustered. This finding suggests that regional inequality is not solely the result of internal regional characteristics but is also shaped by broader spatial dynamics. Consequently, policy instruments that fail to consider spatial interactions may underestimate their full impact or inadvertently reinforce existing disparities.

By incorporating spatial econometric techniques, this study enhances the robustness and policy relevance of the empirical analysis. The spatial model complements the panel econometric approach by capturing geographic spillovers and interregional linkages that are otherwise omitted in traditional regression frameworks. Together, these methods provide a more comprehensive understanding of how policy instruments influence regional income inequality in Uzbekistan and offer valuable insights for designing spatially integrated and development-oriented regional policies.

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To account for spatial dependence, a Spatial Autoregressive (SAR) model is estimated:

$$\ln(Income_{it}) = \rho W \ln(Income_{it}) + X_{it}\beta + \varepsilon_{it}$$

where W is a spatial weights matrix based on regional contiguity.

4. Empirical Results

The empirical analysis reveals pronounced and persistent regional disparities in income levels across Uzbekistan throughout the period 2010–2023. According to data from the Statistical Yearbook of Uzbekistan published by the State Statistics Committee, average household incomes in Tashkent city consistently exceeded the national average, while several regions—most notably Karakalpakstan, Jizzakh, Surkhandarya, and Kashkadarya—remained significantly below the national mean (State Statistics Committee of the Republic of Uzbekistan [SSCRU], 2015; 2020; 2023). Although absolute income levels increased in all regions over time, relative interregional disparities showed only limited convergence.

Panel econometric estimates indicate that infrastructure investment plays a decisive role in shaping regional income dynamics. Regions receiving higher per capita infrastructure investment demonstrated faster income growth compared to regions with weaker investment inflows. This finding is consistent with official investment statistics reported in Regions of Uzbekistan: Statistical Collection, which document a strong concentration of transport, energy, and industrial infrastructure projects in regions integrated into national development corridors (SSCRU, 2018; 2022). The cumulative nature of infrastructure investment suggests that its equalizing effect strengthens over time, contributing to gradual structural transformation in lagging regions.

Human capital expenditure also exhibits a statistically significant and economically meaningful association with regional income growth. Education and vocational training spending increased steadily during the observation period, particularly following the expansion of regional employment and skills programs after 2017. Data from Education in Uzbekistan: Statistical Bulletin indicate that regions with higher enrollment in vocational and technical education experienced improved labor market outcomes and higher wage

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growth (SSCRU, 2019; 2021). These patterns are reflected in the econometric results, which confirm the long-term equalizing potential of human capital policies.

In contrast, fiscal transfers demonstrate a weaker and less stable relationship with regional income convergence. Budgetary data from Public Finance of the Regions of Uzbekistan show that intergovernmental transfers are primarily directed toward balancing regional budgets and financing recurrent expenditures rather than development-oriented investment (Ministry of Finance of the Republic of Uzbekistan, 2020; 2022). As a result, while fiscal transfers help reduce short-term fiscal stress, they do not appear to generate sustained income convergence across regions.

Entrepreneurship and SME development contribute positively to regional income growth, though their impact varies considerably across regions. According to Small Business and Entrepreneurship in Uzbekistan statistical reports, SME density remains highest in urbanized and industrialized regions, while peripheral regions face persistent barriers related to access to finance, infrastructure, and administrative services (SSCRU, 2017; 2022). The empirical results suggest that SME support policies are most effective when combined with broader institutional and infrastructural improvements.

Spatial econometric analysis further confirms that regional income levels in Uzbekistan are geographically interdependent. Migration statistics from Population and Migration in Uzbekistan indicate strong labor mobility toward economically advanced regions, particularly Tashkent city and surrounding areas (SSCRU, 2020; 2023). These mobility patterns generate spatial spillover effects, whereby income growth in leading regions positively influences neighboring regions through commuting, remittances, and production linkages. The spatial dependence observed in the econometric models aligns closely with these officially reported demographic and economic trends.

Taken together, the empirical evidence based on both econometric analysis and official statistical sources suggests that regional income inequality in Uzbekistan is shaped by a combination of structural, policy-driven, and spatial factors. Infrastructure investment and human capital development emerge as the most

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effective instruments for reducing regional income disparities, while fiscal transfers play a more limited, compensatory role.

5. Discussion

The empirical findings of this study provide strong evidence that regional income inequality in Uzbekistan is driven by a combination of structural, policy-related, and spatial factors. The results confirm that not all policy instruments exert the same influence on regional income dynamics, and that development-oriented measures are substantially more effective than compensatory mechanisms in promoting income convergence across regions. These findings are consistent with international evidence from transition economies and contribute new insights by explicitly incorporating spatial interactions among regions.

One of the most important outcomes of the analysis is the dominant role of infrastructure investment in shaping regional income patterns. The strong and persistent association between infrastructure spending and regional income growth suggests that infrastructure functions as a foundational enabling factor for economic activity. In Uzbekistan, improvements in transport connectivity, energy supply, and utility infrastructure reduce geographic isolation, lower transaction costs, and facilitate labor mobility. The cumulative nature of infrastructure investment explains why its equalizing effects intensify over time rather than producing immediate convergence. This finding supports the argument advanced in economic geography literature that infrastructure investments generate long-term structural transformation rather than short-term income redistribution.

Human capital development emerges as the second most effective policy instrument in reducing regional income inequality. The results indicate that regions with sustained investment in education and vocational training experience improved labor market outcomes and higher income growth. This is particularly relevant in Uzbekistan, where regional differences in skill composition and educational access remain pronounced. The findings suggest that human capital policies contribute to income convergence by enabling workers in lagging regions to transition from low-productivity sectors, such as

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subsistence agriculture, to higher-value activities in industry and services. These results align with human capital theory and reinforce the view that education-oriented policies yield stronger equalizing effects over the long term than income support measures.

In contrast, fiscal transfers demonstrate a limited capacity to reduce regional income inequality on a structural basis. While transfers play a stabilizing role by ensuring minimum levels of public service provision, they do not appear to significantly alter income-generating capacity at the regional level. This outcome reflects the predominantly compensatory design of intergovernmental transfers in Uzbekistan, which are largely allocated for recurrent expenditures rather than development investment. Similar patterns have been observed in other transition economies, where transfer systems reduce short-term disparities but fail to induce regional convergence. The findings suggest that fiscal equalization mechanisms should be redesigned to incorporate stronger development incentives.

The role of entrepreneurship and SME development policies is more nuanced. Although higher SME density is associated with higher regional income levels, the strength of this relationship varies considerably across regions. This heterogeneity reflects differences in institutional capacity, access to finance, and infrastructure quality. In regions where supportive institutional environments exist, SME policies contribute meaningfully to income growth and employment creation. However, in regions with weaker administrative capacity, the impact of entrepreneurship support remains constrained. This result underscores the importance of institutional quality as a mediating factor in policy effectiveness and suggests that SME policies cannot substitute for broader structural reforms.

A key contribution of this study lies in its spatial analysis of regional income inequality. The identification of significant spatial dependence confirms that regional income dynamics in Uzbekistan are not confined within administrative borders. Income growth in leading regions generates spillover effects through labor mobility, commuting, trade linkages, and shared infrastructure networks. These spatial spillovers amplify the impact of development-oriented policies, particularly infrastructure investment, and highlight the limitations of territorially fragmented policy approaches. Policies implemented in isolation

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may overlook indirect effects and potentially reinforce existing inequalities if spatial interactions are ignored.

The combined panel and spatial findings suggest that regional income inequality in Uzbekistan is best addressed through a coordinated policy mix that integrates economic, social, and spatial dimensions. Infrastructure and human capital investments generate both direct and indirect benefits, making them particularly effective instruments for promoting balanced development. Fiscal transfers and social assistance remain necessary for ensuring social stability but should be complemented by policies that enhance productive capacity in lagging regions.

From a broader perspective, the results have important implications for development strategy in Uzbekistan. The persistence of regional income inequality despite economic growth indicates that market forces alone are insufficient to ensure territorial convergence. Active and spatially informed public policy is required to counteract agglomeration forces and historical disparities. This conclusion is particularly relevant for countries undergoing structural transformation, where rapid growth can exacerbate spatial inequality if not carefully managed.

Finally, this study contributes to the international literature by providing empirically grounded evidence from a relatively under-researched transition economy. By combining panel and spatial econometric methods with official statistical data, the analysis offers a comprehensive framework for evaluating regional development policies. The findings reinforce the argument that reducing regional income inequality requires long-term, development-oriented interventions rather than short-term redistribution alone.

6. Conclusion

This study has examined the effectiveness of key policy instruments aimed at reducing regional income inequality in Uzbekistan by employing a combination of panel and spatial econometric methods. The analysis demonstrates that regional income disparities in Uzbekistan are persistent and structurally embedded, reflecting historical development patterns, uneven institutional capacity, and spatial concentration of economic activity. Although overall income levels have increased across all regions during the observation period,

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relative differences between leading and lagging regions have remained substantial, indicating limited regional convergence.

The empirical findings provide clear evidence that development-oriented policy instruments are more effective in reducing regional income inequality than compensatory mechanisms. Infrastructure investment emerges as the most influential factor in shaping regional income dynamics. By improving connectivity, reducing transaction costs, and facilitating labor and capital mobility, infrastructure investments contribute to long-term structural transformation in lagging regions. Importantly, the spatial econometric results reveal that infrastructure projects generate significant spillover effects, benefiting not only the targeted regions but also neighboring territories. This underscores the importance of coordinated, spatially integrated development strategies.

Human capital development also plays a central role in promoting income convergence. Sustained investment in education and vocational training enhances regional labor productivity and enables workforce mobility across sectors. The findings suggest that human capital policies are particularly effective in regions with initially low income levels, where skill constraints limit economic diversification. Unlike short-term income support measures, education-oriented policies yield cumulative benefits that strengthen regional resilience and long-term growth potential.

In contrast, fiscal transfers exhibit a limited capacity to reduce structural income disparities. While intergovernmental transfers remain essential for maintaining social stability and ensuring minimum public service provision, their impact on income convergence is weak when they are primarily directed toward recurrent expenditures. This result highlights the need to redesign fiscal equalization mechanisms to incorporate stronger development incentives and to link transfers more closely to regional investment and performance outcomes.

The role of entrepreneurship and SME development policies is found to be conditional on institutional and infrastructural factors. In regions with adequate administrative capacity and access to finance, SME support contributes meaningfully to income growth and employment creation. However, in regions lacking these conditions, entrepreneurship policies alone are insufficient to

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overcome structural disadvantages. This finding emphasizes that SME development should be embedded within a broader policy framework that includes infrastructure, human capital, and institutional strengthening.

A key contribution of this study lies in its explicit consideration of spatial interdependence among regions. The presence of significant spatial spillovers confirms that regional income inequality in Uzbekistan cannot be addressed through territorially isolated policies. Economic developments in leading regions influence income dynamics in neighboring areas through migration, commuting, and production linkages. Ignoring these spatial interactions risks underestimating the full impact of policy interventions and may inadvertently reinforce existing disparities. Spatially informed policy design is therefore essential for achieving balanced territorial development.

From a policy perspective, the findings suggest that reducing regional income inequality in Uzbekistan requires a shift from predominantly compensatory approaches toward development-based strategies that enhance local income-generating capacity. Priority should be given to long-term infrastructure investment, region-specific human capital development, and the creation of enabling environments for entrepreneurship. At the same time, improving regional governance and administrative capacity is critical to ensuring effective policy implementation and maximizing returns on public investment.

Despite its contributions, this study is subject to certain limitations. Data constraints restrict the analysis to available official regional indicators, and potential endogeneity between policy allocation and income outcomes cannot be entirely eliminated. Future research could address these limitations by employing dynamic panel models, incorporating household-level microdata, or exploring sector-specific regional dynamics. Further studies may also examine the interaction between regional inequality and environmental sustainability, demographic change, or digital transformation.

In conclusion, this study demonstrates that regional income inequality in Uzbekistan is a multifaceted challenge that requires coordinated, spatially aware, and development-oriented policy responses. By combining rigorous econometric analysis with official statistical data, the research provides evidence-based insights that can inform more effective regional development

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strategies. The findings contribute to the broader literature on regional inequality in transition economies and offer practical guidance for policymakers seeking to promote inclusive and balanced economic growth.

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