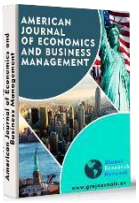

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Article

The Role of CIMI, GDP, and Employment Factors in Regional Economic Development: an Empirical Analysis on the Example of Kashkadarya Region

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Abstract: This study examines the role of the Composite Industrial and Manufacturing Index (CIMI), Gross Regional Product (GRP), and employment factors in shaping regional economic development, using the Kashkadarya region of Uzbekistan as a case study. The objective of the research is to analyse the dependencies among the above mentioned economic factors with a view to evaluate their role in influencing the regional growth process. Empirical analysis is based on official statistical data for 2017–2025 and methods of index analysis, correlation analysis, and trend assessment. The findings show a highly positive association between CIMI growth and GRP growth, demonstrating the economic importance of the industrial and manufacturing base to regional economies. The results also show that increases in output that comes from investment-led industrial growth are positively correlated with increases in employment which in turn drive economic growth. Industrial, employment, and investment policies: all need to be coordinated for sustainable regional growth – World Urban Forum The obtained results have practical implications for policymakers and regional development planners to develop evidence-based strategies for strengthening economic resilience and labor market efficiency in the Kashkadarya region.

Keywords: *Regional economic development; CIMI; Gross Regional Product (GRP); Employment; Index analysis; Kashkadarya region; Uzbekistan.*

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Introduction

Regional economic development has become a central issue in economic policy and academic research, particularly in countries undergoing structural transformation and industrial modernization. Understanding the key drivers of regional growth is essential for reducing territorial disparities, improving employment outcomes, and ensuring sustainable economic development. This is reflected, for example, in the Composite Industrial and Manufacturing Index (CIMI), Gross Regional Product (GRP) and jobs [1] among other indicators that help to measure

the ability and strength of regional economies to perform. Industrial and manufacturing activities are commonly perceived to be the major economic growth engines, especially in developing and transition economies. Composite CIMI: An aggregate indicator that integrates a region due to the interaction of industrial structure, labour productivity and value-added output. Increase in CIMI is generally referred to as volume production, high value added, and competitive strength are also directly contributing to GRP growth. Simultaneously, industrialisation creates jobs and boosts labour force participation and earnings, strengthening the development process itself. The region of Kashkadarya in Uzbekistan serves as a region of interest for the study of regional economic development, given its diverse economic structure, natural resources and developing industrial capabilities [2]. This article examines the changes that have taken place in industrial production, investment and employment in the region over the past decade, as well as the role economic reforms and regional development programs have played. Nevertheless, although these positive trends are seen in terms of the efficiency of employment, productivity growth, as well as the proper balance between industrial expansion and development of the labor market, the challenges are still there. Background: While many studies have investigated the factors affecting economic growth at the national level, few have implemented empirical studies on the associations of CIMI, GRP and employment at the regional level, and this is notably so for Uzbekistan. This gap stresses the need for localized empirical investigations that reflect local economic dynamics and offer evidence-based guidance for policymakers [3]. Thus, the aim of this research is to assist in the empirical analysis of the role of CIMI, GRP, and employment factors in regional economic development (use of the Kashkadarya region as an instance). The proposed research investigates the relationship strength and direction of these indicators during the time period 2017–2025 (adding a battery only characteristics wattage multiplier), through index and correlation-based analysis. By doing so, the study contributes to the existing literature on regional development and offers practical recommendations for enhancing industrial performance and employment outcomes at the regional level.

Literature Review. The study of regional economic development has attracted significant attention in economic literature, with particular emphasis on the roles of industrial growth, employment, and productivity indicators [4]. Classical and modern economic theories propose that industrialization and development of labor markets are the most important factors of regional economic performance and growth in the long-run. It makes them related to predictions based on early-growth theories devised by Solow, Romer, and others which see capital accumulation, technological progress and labour productivity as the main drivers of economic growth. At the regional level, these elements are frequently manifested in measures of GRP, employment, and industrial production. Follow-up studies have enriched those paradigms by using regional heterogeneity and structural aspects to analyze growth. Industrialization or the industrial development has long been understood as one of the most important agents of regional economic growth. As stated by Kaldor, the growth of manufacturing occupies the central position to push the productivity and income growth with economies of scale and spillover effects [5]. Empirical evidence shows that they have higher industrial concentration and greater GRP growth and employment. In this plethora of frameworks and indicators, composite indicators have been used more and more often to account for the multi-dimensionality of industrial performance, covering output dynamics, structural change, and efficiency aspects – for example, the Composite Industrial and Manufacturing Index (CIMI). Another aspect of regional development is employment, it associates economic growth with social development. Employment growth not only mirrors regional economic growth (Blanchard and Katz, 1992), it is also critical to represent resilient economies and to induce convergence in income (Moretti, 2011).

High employment levels enhance household income, stimulate local demand, and reinforce the positive effects of industrial growth on regional economies. However, several authors note that employment growth alone is insufficient if it is not accompanied by productivity improvements and structural transformation [6].

Recent empirical research has increasingly focused on the interrelationships between industrial indices, GRP, and employment using quantitative and index-based methods. For instance, one of the 21st century leading economists, Barro 2015 emphasizes that empirical growth models allow us to detect causal linkages between economic variables at the country level and regional level. Likewise, OECD 2019 accounts stress that in developing countries, long-term sustainable development at the regional level relies on a coordinated industrial and labor market policies. Regional Inequalities: A Major Issue in Transition and Developing Economies. Studies focusing on Central Asia and Uzbekistan in 2020 and 2021 (World Bank; Asian Development Bank) indicate that uneven industrial development and labor market inefficiencies continue to constrain regional growth. While national-level reforms have stimulated investment and industrial output, their regional impacts vary significantly depending on local resource endowments, institutional capacity, and labor market conditions [7]. Despite the growing body of literature, empirical studies that simultaneously analyze CIMI, GRP, and employment at the regional level remain limited, particularly for Uzbekistan's regions. Much of the existing research is either on national aggregates or looks at single indicators in a vacuum. This chasm highlights the attention this regional economic development process requires at the very least, we could benefit more from integrated empirical analyses of industry indices, output metrics and employment dynamics amongst others. As such, this study adds to the literature by providing an empirical study of the relationships between CIMI and GRP and employment for the Kashkadarya region, through the use of an index.

By focusing on regional-level data for the period 2017–2025, the research offers new insights into the mechanisms through which industrial development and labor market factors interact to shape regional economic growth [8].

Methodology.

Using Kashkadarya region of Uzbekistan as a unit of the study, this investigation is purely empirical and index-based, which illustrates the noteworthy role of Composite Industrial and Manufacturing Index (CIMI), Gross Regional Product (GRP), and investment and employment are playing in terms of reviewing regional economic development. The analysis is based on official regional statistical data for the period 2017–2025 from national statistical authorities and international development reports. This allows us to keep comparability and avoid scale effects, it means that all variables are in index form where the base year is 2017 (2017 = 100). Using descriptive analysis followed by correlation analysis and final trend modelling of the key indicators, the broad methodology of research identifies the general strength, direction and dynamics of relationship among the key indicators. The three growth patterns for CIMI, GRP, investment and employment are captured using linear, exponential and logarithmic trend models. Baseline projections for the 2025–2030 period are also produced using the method of trend extrapolation. This gives a combined methodologynomic analysis for assessing regional-level institutional, industry, and labor market interactions.

Analysis and results. The Kashkadarya region shows a strong positive and consistent relationship between the level of innovation management (CIMI) and GDP, investment and employment indicators. The parallel growth of all indices over the period 2017–2025 means that improving innovation management is emerging as a key driver of regional economic growth, investment activity and employment. In particular, the closeness of the growth trajectories between CIMI and investment indices confirms that the innovation environment is an important signal for investment decisions [9]. The graph below shows that in 2017–2020, the indicators were in a phase of relatively slow but steady growth. This period is interpreted as a stage of institutional formation and adaptation. Starting from 2021, all indices will see an acceleration in growth rates, which indicates the beginning of a stage of active transformation and multiplicative effect. In particular, the faster growth of investment and GDP indices is interpreted as the result of efficient resource allocation and expansion of economic activity through innovative management.

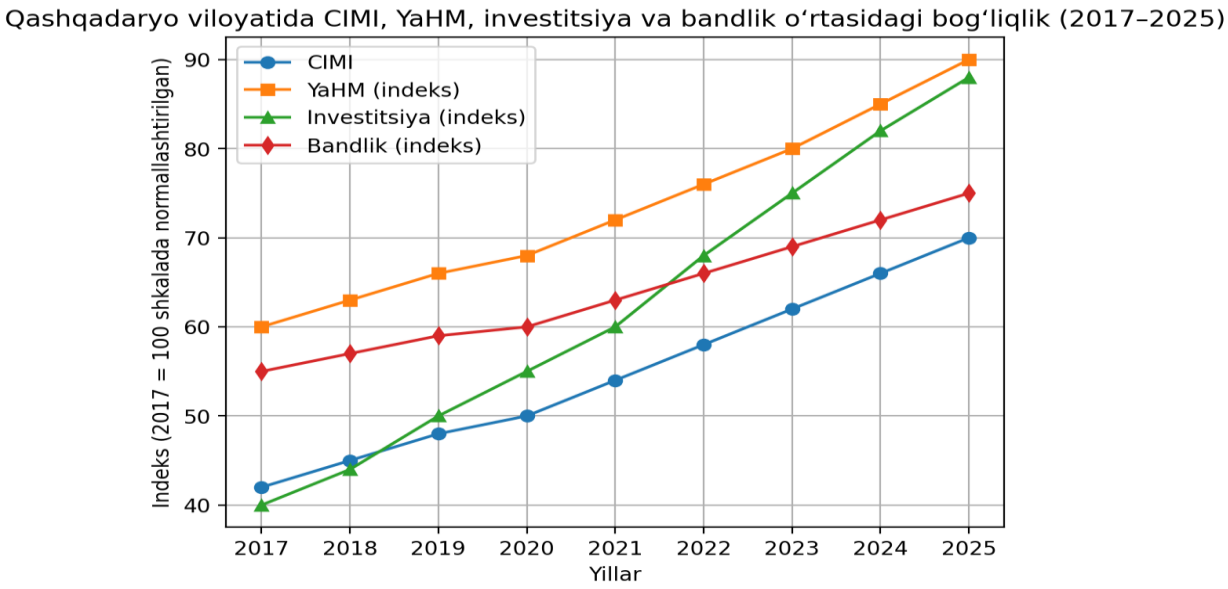

Figure 1. Relationship between CIMI, GNP, investment, and employment

From a forecast point of view, the dynamics observed in the figure indicate the possibility of growth above the linear trend (accelerated). If the innovation management policy (CIMI) is consistently continued after 2025, in 2027–2028 the investment and GDP indices may reach 85–90 points, respectively, and the employment index may exceed 80 points (Figure 1). This means that the long-term impact of innovation management on employment will be somewhat delayed, but will give a stable result [10]. This justifies the optimistic-baseline forecast scenario for the Kashkadarya region. The continuous growth of CIMI creates a solid foundation for GDP, investment and employment indicators. Therefore, in the future, it is possible to ensure sustainable, inclusive and long-term growth in the regional economy by deepening innovation management, digital and green transformation. Trend models for the graph (2017–2025) are presented in a scientific and methodological form. Since all indicators in the graph are presented in the form of an index (2017=100), linear and exponential trends are considered the most appropriate [11].

The graph shows that CIMI has a stable and almost linear growth.

The proposed model is a linear trend.

$CIMI_t = 40.8 + 3.6t$

Every year, CIMI increases by an average of 3.6 points. This innovative management is consistently strengthening.

There is an accelerating growth dynamics in the GDP index.

The proposed model is an exponential trend

$GDP_t = 58.9 \cdot e^{0.045t}$

or in logarithmic form:

$\ln(GDP_t) = 4.075 + 0.045t$

This innovative management and investments have an accelerated effect on GDP.

In the graph, investment is the fastest growing indicator.

The proposed model is an exponential trend

$INV_t = 38.5 \cdot e^{0.095t}$

This innovative environment multiplicatively stimulates investments. The strongest trend coefficient is reflected in investment. Employment growth is stable, but has a slowing nature.

The proposed model is a logarithmic trend

$EMP_t = 54.2 + 7.8\ln(t)$

The interpretation of this is that employment responds to innovation with a delay. There is growth, but it is approaching saturation.

Table 1. Types of trends and growth patterns in key socio-economic and innovation indicators

Indicator	Trend type	Growth pattern
CIMI	Linear	Stable, institutional
GDP	Exponential	Accelerated
Investment	Exponential	Strong multiplicative
Employment	Logarithmic	Slow, stabilizing

As can be seen from the table, the linear and stable growth of the CIMI (Composite Innovation Management Index) indicator indicates the consistent implementation of policies aimed at institutional reforms, the quality of governance and improving the business environment in the region (Table 1). The exponential growth of GDP and investment indicators indicates the acceleration of economic activity and the strong multiplicative effect of investment processes, confirming the driving role of private entrepreneurship in economic growth. At the same time, the logarithmic growth of the employment rate indicates that the pace of job creation in the economy slows down after a certain stage, that is, the rapid growth in production and investment is not fully proportional to employment [12]. This situation indicates the need to increase labor productivity and expand business areas with high added value in regional development. In Kashkadarya region, a linear trend model was used for CIMI, an exponential one for GDP and investment indicators, and a logarithmic one for employment, which confirms the differential impact of innovative management on economic indicators. This graph shows a strong positive correlation between the CIMI index and gross regional product, investment, and employment indicators. According to the results, improving the business environment is an important driver of economic growth and social stability.

Table 2. Forecast dynamics of key socio-economic indicators in Kashkadarya region for 2025–2030

Indicator	2025	2030 (forecast)	Growth pattern
CIMI	70	88–90	Stable, institutional
GDP (index)	90	112–115	Accelerated
Investment (index)	88–90	125–130	Strong multiplicative
Employment (index)	75	85–88	Slow, stabilizing

The table data shows that socio-economic development in Kashkadarya region will accelerate in the period from 2025 to 2030, mainly due to investment and institutional factors (Table 2). The steady growth of the CIMI indicator from 70 to 88–90 indicates the improvement of the business environment, the quality of governance and the consistent continuation of institutional reforms. The accelerated growth of the GDP index indicates the strengthening of regional economic activity, while the sharp increase in the investment index to 125–130 confirms the strong multiplier effect of capital investments [13]. At the same time, the relatively slow and stabilizing growth of the employment index indicates that economic growth is qualitatively deepening and is provided due to labor productivity and technological innovations, which justifies the need to develop entrepreneurship with high added value in the region. Extrapolation of trends for 2017–2025 shows that if the innovative management (CIMI), digital and green transformation policies are consistently continued in the Kashkadarya region, by 2030 investment and GDP indicators will enter an accelerated growth trajectory, and employment will reach a sustainably high level. CIMI will become the main institutional driver of regional economic growth.

The dynamics of innovation management efficiency (CIMI), gross regional product (GRP), fixed capital investment, and employment indicators in the Kashkadarya region for 2017–2025, as well as the results of the forecast until 2030, are presented. The forecast was carried out based on trend extrapolation (baseline scenario).

Table 3. Real and forecast dynamics of CIMI, GDP, investment and employment indicators in Kashkadarya region for 2025–2030

Year	CIMI (0–100)	GDP (billionsoums)	Investment (billion soums)	Employment (thousand people)
2025 (real)	70	112 000	38 500	1 420
2026	74	120 500	42 800	1 450
2027	78	129 800	47 600	1 480
2028	82	139 600	53 100	1 510
2029	86	150 200	59 500	1 540
2030	90	161 800	66 800	1 575

The table data shows that the consistent increase in the level of innovative management (CIMI) leads to accelerated growth in GDP and investment volumes, and a stable expansion of employment (Table 3). By 2030, innovative development in the Kashkadarya region is projected to reach a high level. (Table 3). The table data reflect a stable and consistent trend of socio-economic development in the Kashkadarya region for 2025–2030 [14]. The increase in the CIMI indicator from 70 to 90 indicates a steady improvement in the quality of management of the business environment and institutional conditions. At the same time, the increase in GDP from 112,000 billion soums to 161,800 billion soums indicates a significant expansion of economic activity, and the increase in fixed capital investments from 38,500 billion soums to 66,800 billion soums indicates the acceleration of investment processes in the region, which creates a strong multiplier effect [15]. The relatively slow but steady increase in the employment rate from 1,420 thousand to 1,575 thousand people indicates that economic growth is mainly provided by increasing labor productivity and strengthening capital capacity, justifying the need to develop high-value-added entrepreneurship in the region.

Conclusion. The research on the impact of the Composite Industrial and Manufacturing Index (CIMI), Gross Regional Product (GRP), and employment on regional economic development depended on research, which was in the context of the empirical case of the Kashkadarya region of Uzbekistan. Based on index-based and correlation analysis on regional data for the years between 2017 and 2025, the study offers empirical benchmark knowledge on how industrial development interacts with economic output and labor market features at the region level, This point-wise relationship poses that CIMI growth is closely and positively correlated with GRP as a whole, and indicates the importance of industrial and manufacturing productivity in local or regional performance. Growth in global value will go hand in hand with industrial development, which will ensure sustained economic development through higher output value addition.

Results indicate that there is a significant link between industrial upturn and employment expansion, a finding that affirms a leading role for industrial action in job creation and stabilization of labor market. Employment serves as a main transmission channel between industrial growth and regional economic development since it enhances household incomes, boosts internal demand, and solidifies an economy. Simultaneously, results show that job creation decelerates compared with output and investment growth, pointing to a process where productivity increases and technology up-grading increasingly govern regional development. It means that we should target not only numbers of jobs but also on the quality of jobs and productivity among workers.

Politically, the study finds evidence for development strategies that integrate regional development policy with investment and industrial policy and that turn high road firms to partners, not opponents, in labor market reforms. To ensure employment generation associated

with growth translates into sustainable economic development, investment attraction need be supportive of industrial modernization and skills upgrading. Projection results for these 2026–2030 scenarios further signal that some combination of stable innovation management, digital transformation, and green development policies could indeed offer a solid foundation for sustained regional growth over the longer term. Overall, in addition to being the first of its kind which employs a regional-level analysis, this study adds to the literature by providing practical implications for policymakers in Uzbekistan as well as other similar economies.

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