

## ANALYSIS OF THE IMPACT OF STRUCTURAL CHANGES AND INFRASTRUCTURE CONDITION ON INDUSTRIAL DEVELOPMENT

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**Abstract:** This article examines the impact of structural changes within industrial sectors and the condition of supporting infrastructure on the development of industry. The study analyses how the transition from raw-material based production to higher value-added production, the improvement of cluster cooperation, the deepening of processing stages and the expansion of innovative industrial models influence industrial growth. The research also discusses the role of infrastructure quality such as energy stability, logistics accessibility, digital connectivity and industrial site readiness in accelerating industrial performance. The main conclusion of the study is that structural transformation and infrastructure quality act as complementary mechanisms and when they improve simultaneously, industrial efficiency, export capacity and competitiveness increase at a higher rate.

**Keywords:** industry; structural transformation; infrastructure quality; value added; cluster cooperation; deep processing; logistics; digital connectivity; industrial development; competitiveness.

**Introduction.** Industrial development plays a central role in creating high added value, increasing labour productivity, diversifying the export structure and strengthening regional economic balance. Two influencing factors are especially important in this process. The first is structural changes inside industrial sectors, which include the movement from raw material production to high technology production, the distribution of added value between different stages of processing, and the expansion of cooperation and cluster models. The second is the actual condition of supporting infrastructure such as transport, logistics, energy supply, industrial land, certification laboratories, digital connectivity and human resources training systems. When these factors function well, industrial resources are allocated more efficiently, production cycles become shorter, unit costs fall and the level of competitiveness in domestic and global markets increases.

Structural changes show where and how added value is produced. The shift from simple processing to the production of complex components and intellectual products is an indicator of the quality of industrial development. Intersectoral cooperation and cluster integration reduce transaction costs, speed up the diffusion of innovation and create sustainable export volumes. However, this potential can only be realised if the supporting infrastructure is strong. Transport corridors reduce delivery time, stable energy systems support continuous production, special industrial zones attract private investment, and digital platforms provide conditions for advanced management systems.

The relevance of this research is based on the need to analyse the joint impact of structural changes and infrastructure quality on industrial development. Regional differences in infrastructure also influence the cost structure of enterprises, the capacity utilisation rate and the logistics of export. In addition, the speed of digital transformation and the quality of the human

resource system directly affect the effectiveness of structural changes. The main purpose of this research is to analyse the impact of structural changes and infrastructure condition on industrial development and to develop practical conclusions based on evidence. The object of the study is industrial sectors and their supporting infrastructure systems. The subject of the study is the relationship between structural change indicators and industrial performance indicators such as production volume, labour productivity, export share and capacity utilisation. The methodological basis of the research is the use of mixed methods which combine statistical analysis, econometric modelling and qualitative research instruments.

**Methodology.** This study applied a mixed methodology that combines quantitative indicators and qualitative interpretation in order to evaluate the impact of structural changes and infrastructure conditions on industrial development. The quantitative component of the research was based on official open data sources such as the Statistics Agency of Uzbekistan, reports of the Center for Economic Research and Reforms, the Central Bank and annual industry summaries. Key indicators included industrial output volume, the share of value added, export diversification, labour productivity, the number of operating industrial entities and regional industrial capacity. These indicators were collected as time series and processed in comparative dynamic form to reveal trends in structural shifts.

In parallel, a system of infrastructure indicators was developed to measure the real supportive environment around industrial production. These indicators included the stability of energy supply, logistics and transport accessibility, readiness of industrial sites and special economic zones, availability of certification and testing laboratories and the quality of digital connectivity. Each of these parameters was assessed at regional level and then compared with industrial performance indicators to identify relational patterns. To empirically test the interaction between structural shifts and infrastructure quality, simple linear regression models were used. The modelling objective was to reveal the combined effect of structural indicators and infrastructure indicators on industrial performance measures such as output growth, labour productivity, export share and capacity utilisation. The benefit of this modelling approach is that it highlights not only isolated effects but also the complementarities between the examined variables.

The research also integrated a qualitative component. Expert opinions were collected from industry representatives, enterprise managers, specialists involved in industrial policy implementation and regional development practitioners. These interviews were conducted through semi structured guiding questions and the obtained answers were analysed through qualitative coding. This approach made it possible to identify which parts of the infrastructure become bottlenecks in practice and which structural shifts demonstrate the highest marginal efficiency in real production environments. The main advantage of this mixed methodology is that it does not limit the analysis to statistical correlations only but also explains the logic of actual industrial processes. Quantitative data provided evidence based measurable results and expert based interpretation added contextual meaning. Therefore this research does not simply present a set of figures but aims to clarify the mechanisms through which infrastructure quality and structural shifts jointly influence industrial development.

**Results.** The obtained results demonstrate that industrial performance in Uzbekistan is not only associated with overall macroeconomic conditions but is also significantly shaped by the internal structural composition of industrial sectors and the quality level of the supporting

infrastructure. The time series analysis shows a positive upward trend in industrial output. According to official Statistics Agency data industrial production in 2024 increased by 6.8 percent compared to the previous year which confirms that structural industrial reforms have produced measurable growth effects. Regression results indicate that improvements in value added composition and deeper processing levels have a direct positive correlation with productivity growth. Regions that demonstrate higher levels of cluster integration and intersectoral cooperation also show higher capacity utilisation and export share. The model results suggest that the combination of structural upgrading and infrastructure quality explains a higher share of variance in industrial performance than each of these factors taken separately.

Infrastructure indicators also show strong influence. Regions with more stable energy supply better logistics accessibility and operational industrial zones experience faster output expansion and lower production cycle delays. Digital connectivity was found to be a significant factor as well because regions where enterprises implemented ERP and MES type systems show more accurate production planning and improved resource allocation efficiency. Expert interviews confirmed the quantitative evidence. Representatives of industrial enterprises stated that when infrastructure conditions are reliable structural shifts towards higher value added become commercially rational and economically sustainable. In contrast when infrastructure is weak even technologically advanced projects cannot achieve full performance because a portion of efficiency gains is lost due to transport delays certification bottlenecks or energy instability. Overall the results show that structural transformation and infrastructure quality are complementary forces. When they are improved together the speed of industrial development increases and financial and production risks decrease.

**Conclusion.** The findings of this study confirm that sustainable industrial development depends on the combined effect of structural upgrading inside the industrial system and the quality of the supporting infrastructure surrounding this system. When industries move from raw material based production to higher value added processing and when this shift is supported by reliable energy supply, efficient logistics, operational industrial sites, certification capacities and digital connectivity the economic return becomes significantly higher. The empirical evidence shows that these factors do not operate in isolation because both structural change indicators and infrastructure indicators reinforce each other. Where both components are strong the rate of industrial growth becomes stable and the level of competitiveness increases. The results also highlight that investment decisions and production efficiency are not shaped by technology alone. Enterprises need a functioning ecosystem that reduces transaction costs and supports long cycle industrial decisions. Therefore industrial policy should not be limited to financial incentives or import substitution but should target measurable improvements in infrastructure quality and stimulate deeper processing, cluster cooperation and technology based production planning.

In summary this study shows that if Uzbekistan continues to expand the depth of structural transformation while simultaneously upgrading industrial infrastructure it will increase the resilience of its industrial base reduce external vulnerability and strengthen its position in regional value chains. This combined approach will produce long term benefits not only for

enterprise level performance but for national economic development as a whole.

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