INNOVATION ACTIVITY IN ECONOMIC SECTORS AND THE JUSTIFICATION OF THE EMPIRICAL ANALYSIS PERIOD: EVIDENCE FROM UZBEKISTAN

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Abstract: This article examines the economic significance of innovation activity across major economic sectors and substantiates the selection of 2020-2024 as the main empirical period for analyzing innovation-related indicators in Uzbekistan. Innovation activity is considered as an integrated economic, scientific, and organizational process that includes the generation of new ideas, research and development, the introduction of technologies, product and service innovation, and the commercialization of innovation outcomes. The study systematizes the role of innovation activity in agriculture, manufacturing, energy, construction, trade, transport, information and communication, finance, education, health care, and other sectors. In methodological terms, the article relies on sectoral classification, comparative analysis, and historical-institutional periodization. The results show that innovation activity contributes to productivity growth, competitiveness, export potential, digital transformation, human capital development, and regional economic stability. The period 2020-2024 is justified as the key empirical period because official regional data on innovation output, innovation expenditures, and technological, organizational, and marketing innovation indicators became relatively more systematic during these years. At the same time, earlier stages of institutional formation are considered as a historical background for interpreting the development of the national innovation system.

Keywords: innovation activity; economic sectors; regional development; innovation expenditure; innovation output; Uzbekistan; empirical analysis period

Introduction. Innovation has become one of the main drivers of structural transformation, productivity growth, and long-term economic development. In regional and sectoral economies, innovation activity is not limited to technological modernization alone. It also includes organizational changes, marketing innovations, digital platforms, research and development, start-up ecosystems, technology parks, incubators, and innovation management practices. Therefore, the analysis of innovation activity requires a sector-based and system-oriented approach.

In the context of Uzbekistan, innovation processes have gained particular importance due to ongoing institutional reforms, the development of technology parks, the expansion of digital services, and the increasing role of innovation policy in regional development. The availability of more systematic official data for 2020-2024 makes this period especially relevant for empirical analysis of innovation activity, innovation expenditures, innovation output, and their relationship with economic growth. The purpose of this article is to systematize the economic significance of innovation activity by sector and to justify the selection of the 2020-2024 period as the main empirical basis for further analysis.

Materials and Methods. The article is based on a qualitative and descriptive-analytical research design. The methodological approach combines sectoral classification, comparative analysis, and historical-institutional periodization. Sectoral classification is used to identify the economic significance of innovation activity across major areas of economic activity. Comparative analysis is applied to reveal how different sectors benefit from technological, organizational, and service-related innovations. Historical-institutional periodization is used to justify the selection of 2020-2024 as the main empirical analysis period.

The information base is linked to official data and classifications used by the National Statistics Committee of the Republic of Uzbekistan. The 2020-2024 period is selected because data on innovation output, innovation expenditures, and technological, organizational, and marketing innovations by region became relatively more structured during this period. In addition, earlier institutional stages, including the initial formation of innovation statistics in 2010-2015, the activation of innovation policy after 2017, and the strengthening of the national innovation system in 2022-2025, are considered as contextual background.

Results. Innovation activity is understood as an economic, scientific, and organizational process related to the creation, introduction, and commercialization of new ideas, research outcomes, technologies, products, or services. At the regional level, innovation activity is manifested in the following forms:

- creation of new ideas, research outcomes, technologies, products, or services;
- introduction of new production technologies;
- implementation of research and development (R&D) and experimental design activities;
- development of start-ups, technology parks, and business incubators;
- introduction of innovation management practices aimed at improving enterprise competitiveness.

Table 1. Economic Significance of Innovation Activity by Economic Sector

No.	Economic activity	Economic significance
1	Agriculture, forestry, and fishing	Agricultural innovations contribute to food security, export potential, and agricultural productivity. R&D and agrotechnological modernization support economic stability.
2	Mining and quarrying	Technological innovations improve the efficient use of mineral resources, export revenues, and energy efficiency. Automated and digital mining reduce operational risks.
3	High-technology manufacturing	High value-added production improves competitiveness and export potential. STEM-based human capital and R&D centers support economic growth.
4	Medium-high-technology manufacturing	Innovation supports the creation of products for domestic and export markets, generates employment, and improves productivity through technological skills.
5	Medium-low-technology manufacturing	Innovation improves cost efficiency, production volumes, and the ability to meet domestic demand. Technology transfer contributes to skills development.

No.	Economic activity	Economic significance
6	Low-technology manufacturing	Innovation supports local production, creates jobs for small and medium-sized enterprises, and contributes to economic stability.
7	Electricity, gas, steam, and air conditioning supply	Smart grids and energy-saving technologies improve the efficiency of energy and utility services and ensure stable supply for production and services.
8	Water supply, sewerage, waste management, and remediation	Innovative systems support public health, ecological sustainability, waste recycling, and efficient management of water resources.
9	Construction	Innovative construction technologies reduce costs, modernize infrastructure, and support economic growth in transport, housing, and industrial facilities.
10	Wholesale and retail trade; repair of motor vehicles and motorcycles	Digital trade and logistics connect producers and consumers, increase market turnover, and improve market efficiency.
11	Transportation and storage	Innovative transport and logistics technologies reduce costs, optimize supply chains, and support the uninterrupted delivery of goods and services.
12	Accommodation and food service activities	Service innovations improve customer satisfaction, increase revenues, promote tourism, and create new employment opportunities.
13	Information and communication	Digital platforms, ICT services, and communication infrastructure form the basis of the digital economy and support productivity growth.
14	Financial and insurance activities	Fintech and insurance innovations improve financial service efficiency, stimulate investment flows, reduce risks, and strengthen economic stability.
15	Real estate activities	Innovative services support investment and capital markets, increase property value, and contribute to economic stability.
16	Professional, scientific, and technical activities	R&D, consulting, and professional services strengthen knowledge potential, technology transfer, and the development of innovation products.
17	Administrative and support service activities	BPO and IT services optimize organizational and business processes and improve production and service efficiency.
18	Education	STEM and higher education strengthen human capital, improve skills, and create the foundation for innovation-based economic growth.

No.	Economic activity	Economic significance
19	Human health and social work activities	Telemedicine and innovative medical technologies improve health care efficiency, social stability, and labor productivity.
20	Arts, entertainment, and recreation	Creative industries, media, and VR technologies support cultural development, tourism, and broader social and economic impact.
21	Other economic activities	Start-ups and small business innovations expand innovation opportunities and support economic development.

The sectoral overview indicates that innovation activity has a multidimensional economic role. In production-oriented sectors, its effects are mainly associated with productivity, modernization, resource efficiency, and cost reduction. In service-oriented sectors, innovation contributes to market expansion, customer satisfaction, digital transformation, and improved business processes. In education, health care, and professional services, innovation contributes to human capital formation and long-term economic capacity.

According to official statistical sources, the period 2020-2024 was selected as the main empirical analysis period. This choice is justified by the relatively systematic availability of regional data on innovation output, innovation expenditures, technological innovation, organizational innovation, and marketing innovation. At the same time, the institutional development of the innovation system cannot be fully understood without considering earlier stages of policy and infrastructure formation.

Table 2. Innovation Development Stages Used to Justify the 2020-2024 Empirical Analysis Period

Period	Innovation development stage	Key characteristics
2010-2015	Initial formation stage	The process of institutional and statistical formation of innovation activity began.
2017-2021	Institutional activation stage	State-level support for innovation development was strengthened.
2020	Transformation period under the impact of the pandemic	Investment activity declined in some sectors, while demand for technological innovation increased in others.
2022-2025	Stage of strengthening the national innovation system	Digitalization, technology parks, start-ups, and innovation infrastructure development became more active.

Discussion. The results demonstrate that innovation activity should be treated as a cross-sectoral driver of economic development rather than as a narrow technological category. In Uzbekistan, the economic impact of innovation depends not only on the amount of innovation expenditure but also on the sectoral direction of such expenditure and the institutional environment in which it is implemented. For example, technological innovation has a direct role in manufacturing, mining, energy, construction, and transportation, while organizational and

service innovations are especially important in trade, finance, health care, education, and tourism-related activities.

The selection of 2020-2024 as the empirical analysis period is methodologically important. The COVID-19 pandemic created asymmetric effects across sectors: some traditional sectors faced investment constraints, while demand for digital services, telemedicine, online education, e-commerce, logistics, and automated management systems increased. Therefore, the year 2020 should be interpreted not only as a period of disruption but also as a transformation period that accelerated certain types of innovation demand.

The broader institutional background confirms that innovation development in Uzbekistan has been evolving in stages. The 2010-2015 period may be viewed as an early phase of institutional and statistical formation; the period after 2017 reflects stronger state policy support; and the 2022-2025 period is associated with digitalization, start-up development, technology parks, and the consolidation of the national innovation system. This staged approach helps explain why the 2020-2024 period is suitable for empirical assessment while earlier years remain important as contextual background.

Conclusion. Innovation activity represents a complex economic, scientific, and organizational process that supports productivity, competitiveness, export capacity, digital transformation, and long-term economic stability. Its sectoral effects differ depending on the nature of the economic activity. Production sectors mainly benefit through modernization and productivity gains, while service sectors benefit through digitalization, improved customer relations, and organizational efficiency.

The article justifies the use of 2020-2024 as the main empirical period for studying innovation activity in Uzbekistan because official data on innovation output and innovation expenditures became relatively more systematic during these years. At the same time, the empirical period should be interpreted together with earlier institutional stages that shaped the national innovation system. Future research may extend the analysis by applying econometric models, regional comparisons, and sector-specific indicators to assess the relationship between innovation expenditure, innovation output, and regional economic growth.

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