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EFFICIENCY OF PUBLIC INVESTMENTS IN EDUCATION AND HEALTHCARE: INTERNATIONAL EXPERIENCE AND POLICY IMPLICATIONS FOR UZBEKISTAN

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Annotation: This article examines the efficiency of public investments in education and healthcare based on international experience and modern methodological approaches. The study analyzes recent trends in measuring technical efficiency through Data Envelopment Analysis (DEA), stochastic frontier analysis, dynamic network models, and international benchmarking approaches. Particular attention is given to institutional quality, governance systems, demographic factors, and public expenditure structures as determinants of investment efficiency. The article also evaluates the current situation in Uzbekistan using selected macroeconomic indicators and compares them with international tendencies. The findings demonstrate that the effectiveness of public investments depends not only on the volume of financing but also on governance quality, strategic coordination, and institutional design.

Keywords: Education investment, healthcare expenditure, efficiency analysis, DEA, public policy, human capital, Uzbekistan, public sector efficiency.

Education and healthcare represent the two most important pillars of human capital development in modern economies. Investments directed toward these sectors determine labor productivity, innovation capacity, social welfare, and long-term economic growth. During the last decade, many countries have increased public expenditures on education and healthcare in response to demographic change, digital transformation, and post-pandemic recovery challenges.

International organizations emphasize that the effectiveness of public expenditure is becoming more important than the absolute volume of spending. According to the World Bank, countries with similar expenditure levels often demonstrate significantly different educational and healthcare outcomes because of differences in governance quality, institutional management, and strategic planning.

In Uzbekistan, education and healthcare reforms have become central priorities of socio-economic modernization. Public expenditures on social sectors have increased substantially during recent years. According to the State Committee of the Republic of Uzbekistan on Statistics, expenditures on education account for approximately 5–6% of GDP, while healthcare expenditures have gradually increased after the COVID-19 pandemic.

The purpose of this article is to analyze the international experience of evaluating investment efficiency in education and healthcare and to identify policy implications relevant for Uzbekistan.

The analysis of public sector efficiency has evolved considerably over the last twenty years. Early studies mainly relied on static Data Envelopment Analysis models that compared countries or regions according to inputs and outputs. Later, researchers introduced dynamic and network DEA approaches capable of incorporating multi-stage educational and healthcare processes.

One of the most influential methodological developments has been the integration of Malmquist productivity indices with metafrontier approaches. These models allow researchers to compare countries operating under different technological and institutional conditions. Dynamic

network DEA models are increasingly used because they capture the long-term effects of investments and the interaction between different components of public systems.

At the same time, stochastic frontier analysis has become widely applied in panel data studies. Unlike traditional DEA models, stochastic frontier analysis distinguishes random external shocks from managerial inefficiency. Recent global studies covering more than 150 countries show that governance quality and institutional stability significantly influence the efficiency frontier.

The methodological transition from static to dynamic models reflects the changing understanding of public investment efficiency. Education and healthcare outcomes usually appear with time lags, meaning that short-term evaluations cannot fully reflect the actual social return on investment.

International evidence demonstrates substantial regional differences in public sector efficiency.

Countries in Central and Eastern Europe have achieved relatively high efficiency levels in education and healthcare despite limited fiscal resources. Estonia and Slovenia are frequently identified among the most efficient countries because of digital governance systems, integrated health information platforms, and strong educational reforms.

Research on the CESEE region shows that many countries could achieve current healthcare outcomes with approximately 10–13% fewer resources if institutional inefficiencies were reduced. The studies also indicate that unemployment negatively affects educational efficiency, while higher GDP per capita contributes positively to both sectors.

Asian developing economies increasingly focus on integrating digital technologies into education and healthcare management systems. South Korea and Singapore are often cited as successful examples of strategic investment coordination. Their experience demonstrates that efficiency gains depend on long-term policy continuity and innovation-oriented governance.

China has introduced network DEA models to evaluate hospital reforms and regional healthcare systems. The results reveal that technological modernization combined with institutional reforms significantly improves healthcare productivity.

Studies conducted in African countries indicate that increasing expenditures alone does not automatically improve human capital outcomes. Weak governance structures, corruption, and infrastructural disparities reduce the effectiveness of public investments.

Latin American countries demonstrate significant inequality in education efficiency across regions. Countries with decentralized educational governance often experience stronger regional disparities. However, digital learning systems and targeted teacher training programs have shown positive effects on efficiency indicators.

The social sector occupies a central place in Uzbekistan's state budget. Public expenditures on education and healthcare have increased steadily during recent years.

Table 1.Selected Public Expenditure Indicators in Uzbekistan

Indicator	**2020**	**2022**	**2024**
Education expenditure (% of GDP)	5.2	5.5	5.7

Healthcare expenditure (% of GDP)	3.8	4.1	4.3
Number of higher education institutions	125	154	211
Doctors per 10,000 population	27	29	31
Internet coverage in schools (%)	68	82	95

Source: State Committee of the Republic of Uzbekistan on Statistics, Ministry of Economy and Finance, UNESCO Institute for Statistics.

The expansion of higher education institutions and digital infrastructure reflects the government's emphasis on human capital development. The rapid growth in internet coverage in schools has contributed to broader digitalization of the education system.

Governance quality remains one of the strongest predictors of successful public investment outcomes. Countries with transparent budgeting systems and evidence-based policymaking generally demonstrate higher technical efficiency.

Digital infrastructure has become another critical factor. The COVID-19 pandemic accelerated the transition toward online education and telemedicine systems. Countries with advanced digital infrastructure experienced less disruption in service delivery.

Demographic factors also influence efficiency outcomes. Aging populations increase healthcare expenditures, while high youth populations require larger educational investments.

Uzbekistan possesses substantial opportunities to improve the effectiveness of investments in education and healthcare. Several strategic directions appear especially important.

First, the implementation of performance-based budgeting systems can improve accountability and resource allocation. International experience shows that linking expenditures to measurable outcomes strengthens efficiency.

Second, the integration of digital technologies into public administration should continue. Electronic healthcare systems, digital educational platforms, and unified statistical databases may significantly reduce administrative inefficiencies.

Third, institutional coordination between education and healthcare policies should be strengthened. Human capital development requires integrated approaches rather than isolated sectoral strategies.

Fourth, regional disparities must be reduced. Rural regions in Uzbekistan still face infrastructural limitations and shortages of qualified specialists.

Table 2. Comparative characteristics of efficient public investment systems

Characteristic	High-Efficiency Countries	Developing Economies
Governance model	Transparent and digitalized	Partially centralized
Budgeting system	Performance-based	Input-oriented
Monitoring system	Real-time evaluation	Periodic reporting
Technology integration	High	Medium
Institutional coordination	Strong	Limited

The international experience demonstrates that the efficiency of public investments in education and healthcare depends not only on expenditure volume but also on governance quality, institutional design, technological integration, and strategic continuity.

Modern methodological approaches such as dynamic DEA, stochastic frontier analysis, and metafrontier models provide more accurate instruments for evaluating public sector efficiency. Comparative international studies reveal that countries achieving the highest performance are those capable of combining financial resources with effective institutional management.

For Uzbekistan, the improvement of investment efficiency in education and healthcare requires digital transformation, institutional modernization, evidence-based policymaking, and stronger regional coordination. Long-term human capital development can become one of the key drivers of sustainable economic growth and social welfare.

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