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MUNDARIJA

Radjabov B.A.	Ta'lim tizimida sun'iy intellekt texnologiyalarini joriy etish tajribalari	3
Xakimov Z.A. Xidoyatov M.B.	O'zbekiston oliy ta'lim muassasalarida raqamli brendni shakllantirishda ijtimoiy tarmoqlarning ta'siri	10
Soliyev D.J. Oxunova D.O.	O'zbekistonda islomiy moliya munosabatlarini joriy etish: muommo va yechimlari	18
Abdufattoxonova X.	Sun'iy intellekt texnologiyalarining menejmentdagi qo'llanilishi: Imkoniyatlar va xavflar	25
Otaboyev F.O.	Jahon iqtisodiyotida iqtisodiy o'sish nazariyalari evolyutsiyasi va xalqaro kapital parakatini tartibga solish	31
Sharipov Sh.X.	Smart purkagichlar texnologiyalarining adabiy tahlili	44
Mamasoatov D.R.	Tadbirkorlik subyektlari eksportini rivojlantirishda raqamli platformalaridan foydalanish samaradorligini oshirish yo'llari	49
Han Zihao	A study on the impact of china-uzbekistan transportation connectivity projects on regional trade costs (e.g., the china-kyrgyzstan-uzbekistan railway)	54
Zhang Shaojie	A study on the economic effects of chinese aid in promoting the modernization of education in uzbekistan	61
Wang Anning	Trade Characteristics of Uzbekistan's Imports of Fruit and Vegetable Agricultural Products from Xinjiang, China	69
Omonturdiyev O.E.	O'zbekistonda biznesni boshqarish samaradorligini oshirish va moliyaviy resurslarni optimallashtirish istiqbollari	82
Xaydarov S.X.	Bank xizmatlari samaradorligini oshirishda raqamli bank xizmatlarining o'рни va bunda xorijiy mamlakatlar tajribasi	86
Sobirov A.A.	Marketing ekotizimini boshqarish va muvofiqlashtirish mexanizmlarini takomillashtirish yo'nalishlari	92
Akramov T.A.	Korxonalarda raqamli marketing kommunikatsiya strategiyalaridan foydalanish asosida raqobatbardoshligini oshirish	99
Abduraxmonova F.N.	To'qimachilik korxonalarida tejamkor ishlab chiqarishni rivojlantirish	107
Ботиров Л.Б. Хамидова Н.И.	Порядок организации системы бухгалтерского учета в промышленности строительных материалов	112
Hakimov A.L. Bozorboev X.T. Suyunov Y.B.	Aksiyadorlik jamiyatlarida biznes jarayonlarini boshqarishni raqamlashtirishda ilg'or xorijiy tajribalar tahlili	117
Сайдалиева Г.А.	Қишлоқ хўжалиги ерларини баҳолаш ва унинг натижаларидан фойдаланишнинг назарий ва услубий асослари	127
Mullajonov I.T.	Toshkent viloyatida kichik biznes va xususiy tadbirkorlikni rivojlantirish imkoniyatlari	136
Qudratxo'jayev A.Q.	Sanoat korxonalari faoliyatini aylanma iqtisodiyot modeli asosida takomillashtirish	143

A STUDY ON THE ECONOMIC EFFECTS OF CHINESE AID IN PROMOTING THE MODERNIZATION OF EDUCATION IN UZBEKISTAN

Zhang Shaojie

Second-year Master's Degree Student,
World Economy Department and
International Economic Relations,
Tashkent State University of Economics,
Tashkent, 100003, Uzbekistan
Email: 405080291@qq.com

Anatatsiya: Ushbu tadqiqot 2013 va 2024 yillar oralig'ida O'zbekistonda ta'limni modernizatsiya qilishni jadallashtirishda Xitoy yordamining iqtisodiy ta'sirini o'rganadi. Ta'lim sohasidagi 34 ta Xitoy yordami loyihasini, Jahon banki va O'zbekiston Davlat statistika qo'mitasining makroiqtisodiy ma'lumotlarini va mehnat bozori ko'rsatkichlarini tahlil qilish orqali tadqiqot asosiy natijalarni ochib beradi: Xitoy yordami oliy ta'limning yalpi o'qish darajasini 32,6% ga oshirishga, boshlang'ich va o'rta maktablarning raqamli o'quv uskunalari bilan ta'minlanishini 47,8% ga yaxshilashga va yordam bilan qo'llab-quvvatlanadigan muassasalar bitiruvchilarining o'rtacha ish haqini 19,3% ga oshirishga hissa qo'shdi. Iqtisodiy ta'sir uch yo'nalishda namoyon bo'ladi: inson kapitali sifatini oshirish, ko'nikmalarni moslashtirish orqali sanoatni yangilashni rag'batlantirish va ta'lim infratuzilmasini takomillashtirish orqali mintaqaviy iqtisodiy faollikni rag'batlantirish. Biroq, yordam loyihalarining notekis taqsimlanishi va texnik hamkorlikning yetarli darajada barqaror emasligi kabi muammolar saqlanib qolmoqda. Siyosat bo'yicha tavsiyalar mintaqaviy yordamni taqsimlashni optimallashtirish, ta'lim va sanoat o'rtasidagi aloqani mustahkamlash va iste'dodlarni o'qitish uchun uzoq muddatli hamkorlik mexanizmini yaratishni o'z ichiga oladi.

Kalit so'zi: Xitoy yordami; O'zbekiston; ta'limni modernizatsiya qilish; iqtisodiy samaralar; inson kapitali

Abstract : This study explores the economic effects of Chinese aid in advancing the modernization of education in Uzbekistan between 2013 and 2024. By analyzing 34 Chinese aid projects in education, macroeconomic data from the World Bank and Uzbekistan's State Statistics Committee, and labor market indicators, the research reveals core findings: Chinese aid has contributed to a 32.6% increase in the gross enrollment rate of higher education, a 47.8% improvement in the digital teaching equipment coverage of primary and secondary schools, and a 19.3% rise in the average wage of graduates from aid-supported institutions. The economic effects are manifested in three dimensions: enhancing human capital quality, promoting industrial upgrading through skill matching, and stimulating regional economic vitality via educational infrastructure improvement. However, challenges including uneven distribution of aid projects and insufficient sustainability of technical cooperation persist. Policy recommendations include

optimizing the regional allocation of aid, strengthening the connection between education and industry, and establishing a long-term cooperation mechanism for talent training.

Key words: *Chinese aid; Uzbekistan; education modernization; economic effects; human capital*

Аннотация: В данном исследовании рассматривается экономическое влияние китайской помощи на ускорение модернизации образования в Узбекистане в период с 2013 по 2024 год. Анализ 34 проектов китайской помощи в секторе образования, макроэкономических данных Всемирного банка и Государственного статистического комитета Узбекистана, а также показателей рынка труда позволил выявить ключевые результаты: китайская помощь способствовала увеличению валового охвата высшим образованием на 32,6%, улучшению обеспечения цифровым учебным оборудованием начальных и средних школ на 47,8% и увеличению средней заработной платы выпускников учебных заведений, получивших поддержку, на 19,3%. Экономическое влияние проявляется в трех областях: повышение качества человеческого капитала, стимулирование обновления промышленности за счет сопоставления навыков и стимулирование региональной экономической активности путем улучшения образовательной инфраструктуры. Однако остаются проблемы, такие как неравномерное распределение проектов помощи и недостаточная устойчивость технического сотрудничества. Рекомендации по политике включают оптимизацию регионального распределения помощи, укрепление связи между образованием и промышленностью, а также создание долгосрочного механизма сотрудничества в области подготовки кадров.

Ключевое слово: *Китайская помощь; Узбекистан; модернизация образования; экономические выгоды; человеческий капитал*

I.Introduction. Education modernization is a core pillar of Uzbekistan's national development strategy, as President Shavkat Mirziyoyev emphasized that "quality education is the foundation of economic transformation" (President.uz, 2018). Prior to 2013, Uzbekistan's education system faced multiple bottlenecks: outdated teaching equipment (only 12% of primary and secondary schools had digital classrooms), insufficient high-level talent training capacity (the gross enrollment rate of higher education was 28.7%), and a mismatch between educational outputs and industrial needs (World Bank, 2014).

These issues constrained the accumulation of human capital and hindered sustainable economic growth. Since the launch of the Belt and Road Initiative (BRI) in 2013, China has provided targeted aid to support Uzbekistan's education modernization, covering infrastructure construction, equipment donation, talent training, and institutional cooperation. By 2024, Chinese aid in the field of education had reached \$860 million, involving 34 key projects such as the construction of Tashkent International University of Information Technology and the donation of digital teaching equipment to 500 primary and secondary schools (Belt and Road Portal,

2025). This cooperation aligns with Uzbekistan's "Education Development Strategy 2030" and China's commitment to promoting people-to-people bonds under the BRI (Wikipedia, 2024). Against this backdrop, this study addresses two core research questions: What are the specific economic effects of Chinese aid on Uzbekistan's education modernization (2013–2024)? What are the mechanisms through which education modernization driven by Chinese aid impacts Uzbekistan's economy? The research relies on secondary data from government reports, project evaluations, and labor market statistics, adopting a qualitative descriptive approach combined with quantitative correlation analysis.

II. Literature Review. Scholars have long recognized the economic impact of education modernization. Mincer (1974) proposed that education improves labor productivity and increases individual income, forming a positive cycle of human capital accumulation and economic growth. In the context of international aid, Kassenova (2020) notes that China's aid to Central Asia focuses on "demand-oriented" projects, with education aid complementing infrastructure investment to enhance long-term development capacity. Regarding Sino-Uzbek education cooperation, Zhen, L. (2024) highlights that Chinese aid has helped Uzbekistan narrow the digital divide in education and improve the quality of technical and vocational

education. Rogozhin (2023) adds that talent training programs under Chinese aid have increased the supply of skilled labor in Uzbekistan, supporting the development of emerging sectors such as green energy and manufacturing. Existing studies have two key limitations: Most focus on the social effects of education aid (e.g., enrollment rate improvement) rather than quantifying its economic impacts; Few studies analyze the transmission mechanisms between education modernization and economic growth in the context of Chinese aid to Uzbekistan. This research fills these gaps by identifying specific economic effects and exploring the underlying transmission paths.

III. Methodology. This research uses secondary data and adopts a mixed-methods design (qualitative + quantitative): Data Sources: Primary data: 34 Chinese education aid projects (from Belt and Road Portal and Uzbekistan Ministry of Higher Education, Science and Innovation), macroeconomic indicators (2013–2024) from the World Bank and Uzbekistan State Statistics Committee, and labor market data (graduate employment rate, average wage) from the Ministry of Labor of Uzbekistan. Secondary data: Academic papers, international organization reports (Eurasian Development Bank, 2024), and project evaluation reports from the China International Development Cooperation Agency (2023). Analysis Methods:

Quantitative Correlation Analysis: Explore the correlation between key education indicators (enrollment rate, equipment coverage, talent training scale) and economic indicators (GDP per capita, industrial added value, average wage) using descriptive statistics. **Project Case Study:** Analyze typical aid projects (e.g., university construction, technical training programs) to identify their direct and indirect economic impacts. **Mechanism**

Exploration: Summarize the transmission paths through which education modernization affects the economy, including human capital improvement, skill matching, and infrastructure-driven regional development.

IV.Results and Discussion. Overview of Chinese Aid in Uzbekistan's Education Modernization Table 1 summarizes the key inputs and outputs of Chinese education aid to Uzbekistan (2013–2024)

Aid Category	Specific Content	Scale	Key Outcomes
Infrastructure Construction	Construction/renovation of universities, vocational colleges, and digital teaching centers	8 projects, total investment \$420 million	3 new universities, 12 vocational colleges upgraded; 500 primary and secondary schools equipped with digital classrooms
Equipment Donation	Digital teaching equipment, laboratory instruments, and educational software	12 projects, total value \$180 million	Digital teaching equipment coverage rate of primary and secondary schools increased from 12% to 59.8%
Talent Training	Short-term training programs, academic exchanges, and joint degree programs	14 projects, training 18,600 teachers and technical personnel	3,200 students obtained joint degrees from Chinese and Uzbekistani universities

Table 1. Key Inputs and Outputs of Chinese Education Aid to Uzbekistan (2013–2024)

Source: Compiled by the author based on Belt and Road Portal (2025) and Uzbekistan Ministry of Higher Education (2024) Core Economic Effects Enhancing Human Capital Quality and Promoting Income Growth Chinese aid has significantly improved the quality of Uzbekistan's human capital: The gross enrollment rate of higher education increased from 28.7% (2013) to 38.0% (2024), with graduates from aid-supported institutions accounting for 31% of the total (Uzbekistan State Statistics Committee, 2024). The average wage of graduates from aid-supported universities and vocational colleges is 19.3% higher than the national average, and their employment rate is 12.5% higher (Ministry of Labor of Uzbekistan, 2024). Case study: Tashkent International University of Information Technology, built with Chinese aid (\$150 million), has trained 4,500 IT professionals, with 85% employed in high-tech sectors such as software development and data services, contributing \$230 million to the digital economy annually (Uzbekistan Ministry of Digital Economy, 2024). Promoting Industrial Upgrading Through Skill Matching Chinese aid focuses on training talents in sectors aligned with Uzbekistan's industrial development priorities (green energy, manufacturing, digital economy): 60% of talent training

programs are targeted at technical and vocational education, training 12,000 skilled workers for the energy and manufacturing sectors (China International Development Cooperation Agency, 2023). The proportion of skilled labor in Uzbekistan's manufacturing sector increased from 23% (2013) to 37% (2024), driving the sector's added value to grow at an average annual rate of 8.2% (World Bank, 2024). Example: Chinese-funded green energy projects (e.g., PowerChina's photovoltaic plants) have collaborated with local vocational colleges supported by Chinese aid to train 3,800 technical personnel, improving the operational efficiency of these projects by 15% (Uzbekistan Ministry of Energy, 2024). Stimulating Regional Economic Vitality via Educational Infrastructure The construction of educational infrastructure has driven regional economic development through two channels: Direct Economic Driving: The construction of universities and teaching centers has created 12,000 temporary jobs and boosted the demand for local building materials, contributing \$180 million to the construction sector (Eurasian Development Bank, 2024). Indirect Agglomeration Effect: Areas with new educational institutions have attracted high-tech enterprises and service industries, with the per capita GDP of these regions increasing by 26% compared to non-aid regions (Uzbekistan State Statistics Committee, 2024). Sectoral Distribution of Economic Effects

Shows the impact of Chinese aid-driven education modernization on major economic sectors: Table 2

Sector	Average Annual Growth Rate (2013–2024)	Contribution of Education Modernization	Key Drivers
Digital Economy	12.5%	38.2%	IT talent training, digital teaching popularization
Manufacturing	8.2%	29.7%	Skilled labor supply, technical cooperation
Green Energy	9.8%	31.5%	Professional talent training, technical personnel exchange
Service Sector	7.6%	24.3%	Management talent training, service quality improvement

Table 2. Sectoral Impact of Education Modernization Driven by Chinese Aid (2013–2024) Source: Compiled by the author based on World Bank (2024) and Uzbekistan Ministry of Economy (2024)

Key Challenges Despite positive economic effects, three core challenges remain:

Uneven Regional Distribution: 70% of aid projects are concentrated in Tashkent and Samarkand, while rural and remote regions have limited access to high-quality educational resources (Uzbekistan Ministry of Higher Education, 2024).

Insufficient Sustainability: Technical cooperation relies heavily on short-term Chinese expert support, with local institutions lacking independent operation and maintenance capabilities for donated equipment.

Mismatch Between Education and Industry: Some training programs fail to keep up with the rapid development of emerging sectors (e.g., artificial

intelligence), leading to a gap between graduate skills and market demand.

V.Conclusion. This study analyzes the economic effects of Chinese aid in promoting Uzbekistan’s education modernization (2013–2024). The findings reveal that Chinese aid has significantly improved education quality, enhanced human capital, and driven economic growth through three core effects: income growth from human capital improvement, industrial upgrading via skill matching, and regional economic vitality stimulation. The digital economy, manufacturing, and green energy sectors have benefited most from the talent and skill supply supported by education aid. Key conclusions include: Chinese aid plays a pivotal role in Uzbekistan’s education modernization, providing not only infrastructure and equipment but also targeted talent training that aligns with economic development

needs. Education modernization driven by Chinese aid has obvious economic spillover effects, contributing to both micro-level income growth and macro-level industrial upgrading. Addressing regional inequality, enhancing project sustainability, and optimizing the education-industry connection are critical to maximizing the long-term economic effects of aid. Policy Recommendations Optimize Regional Allocation: Increase aid to rural and remote regions, including building branch campuses of key universities and donating mobile digital teaching equipment. Strengthen Sustainability: Train local technical personnel to operate and maintain donated equipment; establish

long-term institutional cooperation between Chinese and Uzbekistani educational institutions. Promote Education-Industry Integration: Collaborate with Chinese enterprises investing in Uzbekistan to develop customized training programs for emerging sectors such as artificial intelligence and renewable energy. This study provides empirical evidence for the economic effects of education aid and offers insights for policymakers seeking to enhance the effectiveness of international development cooperation. Future research could focus on the long-term impact of education modernization on Uzbekistan's economic growth potential.

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El. pochta: journals@timeedu.uz

Tel.: +998 95 651 90 00

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