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Barqaror rivojlanishda ilm-fan va
innovatsion yondashuvlarning roli

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A P R E L



“Barqaror rivojlanishda ilm-fan va innovatsion yondashuvlarning roli” mavzusidagi respublika ilmiy-amaliy konferensiya materiallari to‘plami. - J.: “D-PRESS SERVICES nashriyoti”, 2026.

Mazkur respublika ilmiy-amaliy konferensiya “Barqaror rivojlanishda ilm-fan va innovatsion yondashuvlarning roli” mavzusiga bag‘ishlangan bo‘lib, unda zamonaviy jamiyat taraqqiyotining ustuvor yo‘nalishlaridan biri hisoblangan barqaror rivojlanish konsepsiyasini ta‘minlashda ilm-fan, innovatsiya va ilg‘or texnologiyalarning ahamiyati keng yoritiladi. Konferensiya doirasida iqtisodiyot, ta‘lim, ekologiya, axborot texnologiyalari, ijtimoiy soha va boshqa yo‘nalishlarda olib borilayotgan ilmiy tadqiqotlar natijalari, ilg‘or tajribalar hamda innovatsion yondashuvlar muhokama qilinadi.

Globalashuv sharoitida davlatimizni yanada barqaror va jadal sur‘atlar bilan rivojlantirish bo‘yicha amalga oshirilayotgan islohotlar samarasini yaxshilash sohasidagi ilmiy-tadqiqot ishlariga alohida e‘tibor qaratilgan. Zero iqtisodiyotning, ijtimoiy sohalarini qamrab olgan modernizatsiya jarayonlari, hayotning barcha sohalarini liberallashtirishni talab qilmoqda.

Ushbu ilmiy ma‘ruza tezislarini to‘plamida mamlakatimiz va xorijlik turli yo‘nalishlarda faoliyat olib borayotgan mutaxassislar, olimlar, professor-o‘qituvchilar, ilmiy tadqiqot institutlari va markazlarining ilmiy xodimlari, tadqiqotchilari, magistr va talabalarning ilmiy-tadqiqot ishlari natijalari mujassamlashgan.

Tadbirning asosiy maqsadi – ilmiy ishlanmalar va amaliyot o‘rtasidagi integratsiyani kuchaytirish, innovatsion faoliyatni rivojlantirish, barqaror iqtisodiy o‘rtni ta‘minlash hamda jamiyatning ijtimoiy va ekologik muammolariga samarali yechimlar ishlab chiqishga ko‘maklashishdan iborat. Shuningdek, konferensiya ilmiy hamkorlikni kengaytirish, yosh tadqiqotchilarni qo‘llab-quvvatlash va ilmiy salohiyatni oshirishga xizmat qiladi.

Konferensiya natijalari sifatida ilg‘or ilmiy g‘oyalar, taklif va tavsiyalar shakllantiriladi hamda ularni amaliyotga joriy etish mexanizmlarini ishlab chiqish ko‘zda tutiladi. Mazkur anjuman ilm-fan, ta‘lim va ishlab chiqarish integratsiyasini mustahkamlash orqali barqaror rivojlanishning muhim omillarini aniqlash va rivojlantirishga qaratilgan.

Mazkur to‘plamga kiritilgan ma‘ruza tezislarining mazmuni, undagi statistik ma‘lumotlar va me‘yoriy hujjatlarning to‘g‘riligi hamda tanqidiy fikr-mulohazalar, keltirilgan takliflarga mualliflarning o‘zlari mas‘uldirlar.

LABOR MARKET TRANSFORMATION IN UZBEKISTAN: CHALLENGES IN EMPLOYMENT POLICY AND THE IMPACT OF DIGITAL ECONOMY TRANSITION

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Abstract. This study examines the transformation of Uzbekistan's labor market between 2018 and 2023, with a focus on the effectiveness of active employment policy (AEP) programs and the influence of digital economy development on employment outcomes. Employing a panel regression model across 14 regions over six years ($N = 84$), the research finds that a one-percentage-point increase in AEP expenditure relative to GDP reduces the unemployment rate by 0.41 percentage points ($\beta = -0.412$, $p < 0.001$). The digitalization index independently reduces unemployment by 0.29 percentage points ($\beta = -0.289$, $p < 0.001$). A field survey ($n = 420$, Jizzakh region) reveals that 71.4% of workers are willing to acquire digital skills, while 54.7% fear job displacement from automation. The study identifies regional disparity, skills mismatch, and the unregulated gig economy as key structural barriers to full employment. Six evidence-based policy recommendations are proposed, including a Digital Skills Passport system, a revised National Qualifications Framework, and legal protections for platform workers.

Keywords: labor market, employment policy, unemployment, hidden employment, labor migration, digital skills, active employment programs, gig economy, Uzbekistan.

INTRODUCTION

The labor market constitutes one of the most critical pillars of any national economy, bridging productive capacity with social welfare. Over the past five years, Uzbekistan has embarked on a series of ambitious structural reforms — including state enterprise privatization, external trade liberalization, and currency convertibility — that have fundamentally reshaped the contours of its labor market. While these reforms have stimulated economic growth averaging 5.8% annually between 2018 and 2023, they have simultaneously generated new structural tensions that require careful policy attention.

Uzbekistan's demographic profile places its labor market under particularly intense pressure. Approximately 600,000 to 700,000 young people enter the workforce annually, creating a persistent gap between labor supply and available formal

employment. This structural imbalance is compounded by significant regional heterogeneity: labor market conditions in Tashkent city diverge sharply from those in Surkhandarya or Karakalpakstan.

A second, globally unprecedented challenge now compounds these domestic pressures: the Fourth Industrial Revolution (4IR) and the proliferation of artificial intelligence are restructuring labor markets worldwide at an accelerating pace. The McKinsey Global Institute (2023) estimates that 30% of current occupations could be automated by 2030. For Uzbekistan — which is simultaneously managing a demographic transition and an economic liberalization — the risks and opportunities of this technological shift demand proactive assessment.

Against this backdrop, the present study pursues four interrelated objectives:

- To document and quantify the structural changes in Uzbekistan's labor market between 2018 and 2023;
- To evaluate the effectiveness of active employment policy (AEP) programs using panel econometric methods;
- To assess the impact of digitalization on labor market outcomes at the regional level;
- To formulate evidence-based policy recommendations for achieving sustainable full employment.

The central hypothesis of this research holds that a combined strategy of expanded active employment programming and digital skills development represents the most effective pathway for reducing unemployment and enhancing labor productivity in the Uzbek context.

1.1. Literature Review

Labor market theory has evolved substantially over the past century. Classical economists, following Pigou (1933), conceived of labor markets as self-equilibrating systems where wages clear supply and demand. This view was systematically challenged by Keynesian and institutional economists, who demonstrated the role of rigidities, information asymmetries, and power dynamics in producing persistent unemployment.

Contemporary scholarship on technological change and labor has been dominated by the works of Acemoglu and Restrepo (2018, 2019), who developed the task-based framework distinguishing between the displacement and reinstatement effects of automation. Their empirical findings for advanced economies show that while automation displaces routine labor, new tasks created by technological progress can — under the right institutional conditions — more than compensate for job losses.

For Central Asian labor markets specifically, Danzer and Ivaschenko (2010) and Castaldo et al. (2012) have documented the prevalence of hidden employment and the critical role of labor migration as a household income stabilization mechanism. Their findings suggest that measured unemployment rates in the region systematically understate true labor market slack by a factor of 1.5 to 2.0.

Within the Uzbek literature, Yusupov (2019) and Karimov and Toshmatov (2021) have identified skills mismatch as the dominant structural challenge. Their research demonstrates that misalignment between formal education outputs and employer skill demands imposes an estimated 0.3 to 0.5 percentage-point drag on potential GDP growth annually. The present study builds upon this body of work by incorporating panel regression methodology and primary survey data to provide more granular and recent estimates.

II. METHODS

2.1. Data Sources

This study draws on four categories of data sources:

1. Administrative records — Annual employment statistics from the Ministry of Employment and Labor Relations of the Republic of Uzbekistan (2018–2023);

2. National statistical surveys — Labor force surveys conducted by the Statistics Agency under the President of the Republic of Uzbekistan, providing regional-level unemployment and economic activity rates;

3. International databases — ILO ILOSTAT, World Bank World Development Indicators (WDI), and UNCTAD digitalization indices;

4. Primary field survey — An original survey of 420 respondents conducted in Jizzakh region during March–May 2023, covering digital skill levels, employment status, platform work participation, and attitudes toward technological change.

The panel dataset covers all 14 administrative units of Uzbekistan (12 regions, Tashkent city, and the Republic of Karakalpakstan) over six years, yielding $N = 84$ region-year observations.

2.2. Econometric Model

The baseline panel regression model takes the following form:

$$UN_{it} = \alpha + \beta_1 AP_{it} + \beta_2 DI_{it} + \beta_3 EDU_{it} + \beta_4 MIG_{it} + \mu_i + \nu_t + \varepsilon_{it}$$

where: UN = unemployment rate (%); AP = AEP expenditure as % of GDP; DI = digitalization index (0–100); EDU = tertiary and vocational education enrollment rate (%); MIG = internal labor migrants (thousands); μ_i = region fixed effects; ν_t = year fixed effects; ε_{it} = idiosyncratic error term.

The model was estimated using the two-way fixed-effects estimator with Driscoll-Kraay standard errors to account for cross-sectional dependence and heteroscedasticity. Robustness checks were conducted using random effects and first-difference specifications.

2.3. Additional Analytical Methods

– Shift-share decomposition — to disentangle structural from within-sector employment changes;

– K-means cluster analysis — to classify regions by composite labor market performance scores;

– Lorenz curve and Gini coefficient — to measure earnings inequality among employed individuals;

– Descriptive and thematic analysis — to process open-ended responses from the field survey.

2.4. Limitations

Several limitations warrant acknowledgment. First, hidden employment in Uzbekistan is not systematically measured through a dedicated survey instrument; estimates rely on auxiliary indicators and are subject to measurement error. Second, the field survey covers only Jizzakh region, limiting direct generalizability to other regions. Third, the digitalization index is constructed by adapting the DESI methodology to available Uzbek data, introducing potential construct validity concerns. These limitations are accounted for in the interpretation of results.

III. RESULTS

3.1. Labor Market Trends (2018–2023)

Table 1 presents the evolution of key labor market indicators across the study period. Several notable trends emerge.

Table 1.

Key labor market indicators, Uzbekistan, 2018–2023

Indicator	2018	2019	2020	2021	2022	2023
Unemployment rate (%)	9.3	9.1	10.5	9.8	9.2	8.4
Economically active population (mn)	14.2	14.6	14.8	15.1	15.6	16.0
Formally employed (mn)	12.9	13.3	13.2	13.6	14.2	14.7
Estimated hidden employment (mn)	3.8	3.6	4.1	3.9	3.5	3.2
External labor migrants (mn)	1.8	2.0	1.6	1.9	2.1	2.3
AEP expenditure (bn UZS)	1,420	1,980	2,340	3,100	4,200	5,800
Female economic activity rate (%)	41.0	42.1	43.0	43.8	45.1	46.0

Sources: Statistics Agency of Uzbekistan; ILO ILOSTAT; Ministry of Employment and Labor Relations.

The unemployment rate declined from 9.3% in 2018 to 8.4% in 2023, interrupted by a COVID-19-related spike to 10.5% in 2020. Estimated hidden employment fell by approximately 22% over the period — from 4.1 million to 3.2 million — partly reflecting formalization efforts and partly the emergence of digital platform work as an alternative income source. Particularly noteworthy is the steady increase in female economic activity, rising from 41.0% to 46.0% over five years, a trend accelerated by the expansion of remote work opportunities during the pandemic.

3.2. Regional Cluster Analysis

K-means cluster analysis assigned Uzbekistan's 14 administrative units to three performance clusters (Table 2). The magnitude of regional disparity is striking: the unemployment rate in Group C regions is precisely double that of Group A regions.

Table 2.

Regional cluster classification by composite labor market performance, 2023

Cluster	Regions	Mean Unemployment (%)	Dominant Characteristic
A — Advanced	Tashkent city, Samarkand, Bukhara	6.2	Diversified, services-led employment
B — Intermediate	Jizzakh, Syrdarya, Namangan, Fergana	8.9	Mixed agro-industrial structure
C — Lagging	Kashkadarya, Surkhandarya, Khorezm, Karakalpakstan	12.4	High hidden employment; limited diversification

The shift-share decomposition reveals that approximately 58% of the unemployment differential between clusters A and C is attributable to structural factors (i.e., the sectoral composition of regional economies), while 42% reflects within-sector productivity differentials. This finding underscores the importance of structural diversification policies, not only productivity-enhancing measures, for lagging regions.

3.3. Regression Results

Table 3 presents the main regression estimates. All four explanatory variables are statistically significant, and the model explains approximately 71% of within-region variation in unemployment rates.

Table 3.

Two-way fixed-effects panel regression results (Dependent variable: regional unemployment rate)

Variable	Coefficient (β)	Std. Error	t-statistic	p-value
AEP expenditure (AP)	−0.412	0.087	−4.74	0.000***
Digitalization index (DI)	−0.289	0.063	−4.59	0.000***
Education enrollment (EDU)	−0.176	0.054	−3.26	0.001***

Variable	Coefficient (β)	Std. Error	t-statistic	p-value
Labor migration (MIG)	+0.134	0.048	+2.79	0.006**
Constant (α)	11.240	1.230	+9.14	0.000***

*Note: *** $p \leq 0.001$; ** $p \leq 0.01$. R^2 (within) = 0.714; Adjusted R^2 = 0.698; N = 84 (14 regions $\times$ 6 years). Standard errors are Driscoll-Kraay robust.*

The negative and significant coefficient on AEP expenditure ($\beta = -0.412$) implies that a one-percentage-point increase in active labor market program spending relative to GDP reduces the regional unemployment rate by 0.41 percentage points. At current spending levels, this translates to approximately 28,000–35,000 additional employed individuals per percentage-point increase.

The digitalization index coefficient ($\beta = -0.289$) confirms a statistically robust labor market dividend from digital infrastructure development, independent of direct employment program expenditure. This finding is consistent with the proposition that digitalization reduces information frictions in job matching, expands the geographic reach of labor demand, and stimulates new service-sector employment.

The positive sign on the migration variable ($\beta = +0.134$) reflects what we term the migration paradox: while outmigration temporarily relieves pressure on regional labor markets, the sustained exit of human capital undermines long-run labor productivity and formal employment growth in sending regions.

3.4. Field Survey: Digital Readiness and Labor Market Perceptions

Table 4 summarizes selected findings from the Jizzakh region field survey ($n = 420$).

Table 4.

Field survey results, Jizzakh region (March–May 2023, $n = 420$)

Indicator	Share (%)
Workers possessing basic digital skills	38.2
Respondents who found employment via online platforms	22.6
Workers engaged in remote (distance) work	14.8
Respondents willing to pursue digital skills training	71.4
Workers expressing fear of job displacement from automation	54.7
Female respondents reporting improved work flexibility post-2020	63.1
Respondents unaware of government retraining programs	58.9

A particularly significant finding is the tension between high automation anxiety (54.7%) and strong digital skill acquisition intent (71.4%). This suggests that workers in Uzbekistan are not disengaged from the digital transition but rather lack adequate institutional pathways to act on their readiness. Compounding this, nearly 59% of respondents were unaware of any government-supported retraining programs, pointing to a severe awareness gap in employment service delivery.

IV. DISCUSSION

4.1. Contextualizing the Findings within International Evidence

The estimated AEP effectiveness coefficient ($\beta = -0.412$) falls within the range documented in Kluve's (2010) meta-analysis of 19 countries (-0.35 to -0.50), suggesting that the institutional infrastructure for active employment programs in Uzbekistan is broadly functional, even if the coverage remains limited. The digitalization coefficient ($\beta = -0.289$) is modestly lower than estimates for Kazakhstan ($\beta = -0.38$) and Georgia ($\beta = -0.31$), consistent with Uzbekistan's earlier stage of digital infrastructure development and pointing to the potential gains from closing this gap.

Acemoglu and Restrepo's (2019) reinstatement effect theory predicts that technological progress creates new task categories requiring human labor. The survey finding that 71.4% of Uzbek workers are willing to pursue digital training is consistent with this theoretical expectation, but the finding that 58.9% are unaware of retraining programs reveals a critical institutional failure in connecting supply (worker readiness) with demand (government-funded programs).

4.2. The Skills Mismatch Problem

The skills mismatch problem identified by Karimov and Toshmatov (2021) appears to have deepened rather than narrowed over the study period. According to the Ministry of Employment and Labor Relations (2024), 34% of advertised vacancies in 2023 remained unfilled for more than six months. The primary reported reason was the absence of qualified applicants — not wage dissatisfaction or geographic barriers.

This mismatch has a temporal dimension that current policy does not adequately address. OECD (2023) data indicate that the average curriculum revision cycle in vocational education systems runs 5–7 years, whereas the technological demand for new competencies shifts every 2–3 years. Bridging this structural lag requires moving toward modular, stackable credentials and employer-integrated curriculum governance — mechanisms largely absent from Uzbekistan's current vocational education system.

4.3. The Gig Economy Dilemma

An estimated 380,000 individuals in Uzbekistan earned income through digital platforms in 2023 — including delivery applications, e-commerce marketplaces, and freelancing networks — yet remain entirely outside the formal employment regulatory framework. This population is invisible in official unemployment statistics and simultaneously vulnerable to income volatility, workplace accidents, and health shocks without any social protection coverage.

The ILO (2022) has identified the regulation of platform work as among the most urgent challenges facing labor ministries globally. Several jurisdictions — including Spain, the United Kingdom, and California — have enacted legislation establishing minimum standards for platform workers. Uzbekistan's absence of any such regulatory framework represents both a labor rights deficit and a fiscal concern: platform workers contribute to consumption but not to social insurance funds, generating long-term fiscal liabilities as they age.

4.4. COVID-19 and Structural Scarring

The COVID-19 shock of 2020 produced significant structural scarring in Uzbekistan's labor market. Of the 126,000 individual entrepreneurs who ceased operations in 2020, only 67% had resumed formal activity by 2023. The remaining 33% — predominantly in retail, hospitality, and personal services — have migrated into informal self-employment or emigrated, representing a persistent erosion of the formal employment base.

The pandemic did, however, produce one durable structural benefit: it normalized remote work arrangements and accelerated platform adoption in the services sector. The increase in female economic activity from 41.0% to 46.0% over 2018–2023 is partly attributable to the expanded availability of flexible, home-compatible work arrangements — a finding corroborated by the field survey, in which 63.1% of female respondents reported improved work flexibility since 2020.

4.5. The Migration Paradox and Human Capital

The positive regression coefficient on labor migration ($\beta = +0.134$) — the migration paradox — deserves careful interpretation. In the short run, emigration reduces visible unemployment by removing workers from the measured labor force. In the medium and long run, however, the selective exit of working-age, relatively educated individuals reduces the stock of human capital in sending regions, constraining productivity growth and formal sector expansion.

Uzbekistan's remittance flows — totaling approximately USD 16.4 billion in 2023, equivalent to roughly 16% of GDP — provide a macroeconomic buffer but do not substitute for human capital retention. A productive diaspora policy would aim to channel diaspora savings into entrepreneurship and productive investment in home regions, rather than solely into consumption, thereby converting a brain drain into a circulatory human capital flow.

V. CONCLUSION

5.1. Principal Findings

This study has generated five principal empirical findings:

1. AEP effectiveness confirmed — active labor market program expenditure reduces regional unemployment by 0.41 pp per 1 pp of GDP, establishing a robust empirical basis for program expansion ($\beta = -0.412$, $p < 0.001$).

2. Digitalization dividend demonstrated — the digitalization index independently reduces unemployment by 0.29 pp ($\beta = -0.289$, $p < 0.001$), independent of direct employment expenditure.

3. Regional disparity is deep and structural — 58% of the unemployment differential between advanced and lagging regions is attributable to structural, not productivity, factors — requiring sectoral diversification rather than only skills upgrading.

4. The migration paradox holds — outmigration temporarily reduces unemployment but exerts a medium-term negative effect on regional human capital stocks and formal employment growth.

5. Digital readiness exists but pathways are absent — 71.4% of workers are willing to train digitally, yet 58.9% are unaware of government retraining programs, revealing a systemic implementation and communication failure.

5.2. Policy Recommendations

Six evidence-based recommendations emerge from this analysis:

1. Increase AEP expenditure in lagging regions — scale AEP spending in Group C regions from the current 0.8% to at least 1.5% of regional GDP. Econometric projections suggest this would generate 120,000 to 150,000 additional formal jobs within three years.

2. Introduce a Digital Skills Passport — implement a nationally recognized, micro-credential-based Digital Skills Passport system (adapting Estonia's and Georgia's models) that enables workers to certify competencies independent of formal education and use them portably across employers.

3. Reform the National Qualifications Framework — mandate biennial curriculum revision cycles for vocational and technical education institutions, with employer councils holding veto power over curriculum adoption, to close the structural lag between skill supply and demand.

4. Enact platform worker protections — introduce a dedicated chapter on platform work in the Labor Code establishing minimum standards for income continuity, occupational injury insurance, and maternity leave entitlements for workers earning more than 50% of income from a single platform.

5. Launch a productive diaspora investment program — design a co-investment vehicle — modeled on Mexico's 3x1 Program — matching diaspora remittances directed to home-region enterprises with government and municipal subsidies, converting remittance flows into productive capital.

6. Create a real-time labor market intelligence platform — develop an open-data API-based platform publishing vacancy data, regional skill demand forecasts, and AEP program availability in real time, directly addressing the awareness gap identified in the field survey.

5.3. Directions for Future Research

This study opens several productive avenues for future inquiry:

- Sector-level analysis of automation risk and employment displacement in Uzbekistan using occupational task-content data;
- Longitudinal study of gig economy worker welfare trajectories, including income volatility and access to healthcare;

- Quasi-experimental evaluation of specific AEP program types (public works, wage subsidies, training vouchers) using difference-in-differences methodology;
- Gender-disaggregated analysis of digital labor market participation, examining barriers specific to women in rural areas.

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