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THE IMPACT OF ECONOMIC GROWTH ON UNEMPLOYMENT IN CENTRAL ASIA

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Abstract: This study investigates the dynamic relationship between economic growth (measured by real GDP growth) and unemployment across the five Central Asian economies—Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan—over the period 2000–2023. The region's transition economies offer a unique context where rapid economic development, often driven by commodity exports and foreign direct investment, does not consistently translate into proportional job creation, reflecting deviations from Okun's Law. Using panel data techniques, including the Panel Autoregressive Distributed Lag (P-ARDL) model and the Vector Error Correction Model (VECM), the research estimates short-run and long-run elasticities between economic growth and unemployment. Findings reveal significant heterogeneity across countries. A statistically significant negative long-run relationship is confirmed, indicating that a 1% increase in GDP growth is associated with a decline in unemployment; however, the magnitude varies due to differences in economic structure. Short-run estimates reveal substantial variation, suggesting labor market rigidities and mismatches between labor supply and demand. Countries dependent on extractive industries display weaker job elasticity, resulting in "jobless growth." This study contributes to the empirical literature by offering updated, region-specific evidence that can assist policymakers in promoting more inclusive and employment-rich growth through economic diversification and investment in human capital.

Key words: Economic Growth, Unemployment, Central Asia, Okun's Law, Panel Data Analysis, P-ARDL, Jobless Growth, Labor Market Dynamics, Transition Economies.

Annotatsiya: Ushbu tadqiqot 2000–2023-yillar davomida Markaziy Osiyoning besh davlati — Qozog'iston, Qirg'iziston, Tojikiston, Turkmaniston va O'zbekiston iqtisodiy o'sishi (real YaIM o'sishi) hamda ishsizlik darajasi o'rtasidagi dinamik bog'liqlikni o'rganadi. Mintaqa iqtisodiyotlari ko'p hollarda xomashyo eksporti va to'g'ridan-to'g'ri xorijiy investitsiyalarga tayanib rivojlangan bo'lsa-da, bu jarayon har doim ham bandlikning mutanosib oshishiga olib kelmaydi. Bu holat Okun qonuni bo'yicha kutilgan natijalardan chetlanish mavjudligini ko'rsatadi. Panel ma'lumotlar asosida, jumladan, Panel ARDL va VECM modellari qo'llanilgan holda iqtisodiy o'sish va ishsizlik o'rtasidagi qisqa va uzoq muddatli elastikliklar baholandi. Natijalar mamlakatlar kesimida sezilarli farqlarni ko'rsatadi. Uzoq muddatda iqtisodiy o'sish va ishsizlik o'rtasida statistik jihatdan ahamiyatli salbiy bog'liqlik mavjud bo'lib, YaIMning 1 foizga o'sishi ishsizlik darajasining pasayishiga olib kelishi aniqlangan. Biroq qisqa muddatli ta'sirlar keskin farqlanadi, bu esa mehnat bozorida rigidliklar va kasbiy nomuvofiqliklar mavjudligini anglatadi. Xususan, qazib olish sanoatiga tayanadigan mamlakatlarda o'sishning bandlikka ta'siri sust bo'lib, "ishsiz o'sish" holati kuzatiladi. Tadqiqot mintaqaviy darajadagi yangilangan amaliy dalillarni taqdim etib, inkluziv va bandlik yaratishga yo'naltirilgan iqtisodiy siyosat ishlab chiqishda muhim ahamiyat kasb etadi.

Kalit so'zlar: Iqtisodiy o'sish, Ishsizlik, Markaziy Osiyo, Okun qonuni, Panel tahlili, P-ARDL, Ishsiz o'sish, Mehnat bozori dinamikasi, O'tish davri iqtisodiyotlari.

Аннотация: В данном исследовании анализируется динамическая взаимосвязь между экономическим ростом (измеряемым ростом реального ВВП) и уровнем безработицы в пяти странах Центральной Азии — Казахстане, Кыргызской Республике, Таджикистане, Туркменистане и Узбекистане — за период 2000–2023 годов. Экономике региона, находящиеся в переходном периоде, характеризуются тем, что быстрый экономический рост, основанный преимущественно на экспорте сырья и прямых иностранных инвестициях, не всегда приводит к пропорциональному созданию рабочих мест, что отражает отклонения от закона Окуна. Используя панельные методы анализа, включая

модель Panel ARDL и векторную модель коррекции ошибок (VECM), исследование оценивает краткосрочные и долгосрочные эластичности между экономическим ростом и безработицей. Результаты показывают существенную неоднородность между странами. Подтверждена статистически значимая отрицательная долгосрочная связь: увеличение ВВП на 1% сопровождается снижением уровня безработицы, однако величина эффекта различается в зависимости от структуры экономики. Краткосрочные коэффициенты демонстрируют значительные различия, что указывает на жесткость рынка труда и несоответствие между спросом и предложением рабочей силы. Страны, зависящие от добывающих отраслей, имеют более слабую эластичность занятости, что приводит к феномену «роста без рабочих мест». Исследование вносит вклад в эмпирическую литературу, предоставляя обновленные региональные данные, важные для разработки инклюзивных и ориентированных на занятость стратегий роста, включая диверсификацию экономики и развитие человеческого капитала.

Ключевые слова: Экономический рост, Безработица, Центральная Азия, Закон Окуна, Панельный анализ, P-ARDL, Рост без рабочих мест, Динамика рынка труда, Переходные экономики.

INTRODUCTION

The symbiotic yet complex relationship between economic growth and unemployment stands as a foundational pillar of macroeconomic inquiry and a critical concern for policymakers globally. Traditional economic theory, notably epitomized by Okun's Law, posits a clear negative correlation: as real output growth surpasses its potential, the unemployment rate tends to fall. This relationship is not merely academic; it is central to evaluating the efficacy of national development models and ensuring that macroeconomic success translates into tangible social welfare improvements.

In the context of Central Asia—comprising Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan—this relationship takes on a unique and pressing significance. Following the dissolution of the Soviet Union, these nations embarked on distinct, yet universally challenging, transitions toward market economies. The region has since experienced periods of substantial, rapid economic expansion, largely fueled by vast natural resource endowments (particularly in Kazakhstan and Turkmenistan), significant infrastructure investment, and, more recently, wide-ranging market liberalization reforms (most notably in Uzbekistan). However, this growth trajectory has been frequently criticized for not being sufficiently inclusive, often failing to generate employment opportunities at a pace commensurate with economic expansion. This phenomenon, often termed “jobless growth,” raises fundamental questions about the structural integrity and long-term sustainability of the region's development pathways.

The existing body of literature on the Okun's relationship is vast at the global and regional levels, yet focused empirical studies specifically dedicated to the five Central Asian states remain sparse. Current research often aggregates these nations into broader “emerging market” or “Eurasian” categories, thereby overlooking the unique national disparities in economic structure, labor market rigidities, demographic pressures, and institutional quality. For instance, Kazakhstan and Turkmenistan, with capital-intensive extractive industries dominating their GDP, may exhibit a weaker job-elasticity of growth compared to the more labor-intensive, manufacturing and service-oriented economies of Uzbekistan and the Kyrgyz Republic. This heterogeneity necessitates a disaggregated, in-depth analysis.

This study addresses this empirical and analytical gap by providing a contemporary, econometric investigation into the impact of economic growth on unemployment dynamics across the Central Asian economies from 2000 to 2023. We move beyond simple correlation analysis by employing advanced panel data methodologies, including the Panel Autoregressive Distributed Lag (P-ARDL) model and Vector Error Correction Model (VECM) framework. The P-ARDL approach is particularly well-suited for this analysis as it allows for the examination of both short-run dynamics and the long-run equilibrium relationship between the variables, accommodating potential cointegration while accounting for cross-country heterogeneity.

The primary objectives of this research are threefold:

1. To empirically test the validity of Okun's Law (or its deviations) across the Central Asian region as a panel and individually for each country.
2. To estimate the short-run adjustment mechanisms and long-run elasticities of unemployment to real GDP growth.
3. To provide evidence-based policy implications for national governments to foster more inclusive, employment-generating economic structures.

The subsequent structure of the paper is organized as follows: Section 2 provides a review of the theoretical framework and related empirical literature. Section 3 outlines the data sources and the econometric methodology employed. Section 4 presents and discusses the empirical results, including both short-run and long-run estimates. Finally, Section 5 concludes the study with key findings and policy recommendations.

LITERATURE REVIEW

The relationship between economic activity and labor market outcomes has been one of the most extensively studied areas in macroeconomics. This section reviews the theoretical underpinnings of this relationship, explores global and regional empirical evidence, and highlights the specific context of transition economies relevant to Central Asia.

1. Theoretical Framework: Okun's Law

The foundation of the relationship between output and unemployment is articulated by Okun's Law, first empirically established by Arthur Okun in the 1960s. Okun's original work demonstrated a clear inverse correlation: for every 1% deviation of real GDP from its potential level, the unemployment rate deviates in the opposite direction by approximately 0.3 percentage points (Okun, 1962). This correlation is attributed to several mechanisms, including cyclical labor hoarding, changes in working hours, and fluctuations in labor force participation rates in response to changes in aggregate demand.

Methodologically, empirical studies typically employ three main specifications of Okun's Law:

1. **Difference Form:** Relates the change in the unemployment rate to the change in output growth. This is commonly used for short-run dynamics.
2. **Gap Form:** Relates the unemployment gap (actual minus natural rate) to the output gap (actual minus potential GDP). This is used for long-run equilibrium.
3. **Dynamic/Lagged Form:** Includes lagged dependent and independent variables to capture adjustment speeds and persistence, often utilized within ARDL or VECM models.

The resulting Okun's coefficient (beta) is critical; its magnitude reflects the responsiveness of the labor market to economic fluctuations. A low coefficient may signal structural rigidities, such as slow worker reallocation, or the presence of capital-intensive growth ("jobless growth").

2. Global and Regional Empirical Evidence

Empirical literature confirms the validity of Okun's Law across diverse economies, though the coefficient (beta) varies significantly:

- **Developed Economies:** Studies on OECD countries typically find a robust, albeit lower, Okun's coefficient (e.g., typically between -0.2 and -0.5). For instance, numerous studies confirm the law's stability in the United States and the Eurozone, though the coefficient has been observed to change over time due to shifts in technology and labor market flexibility (e.g., Ball et al., 2017).
- **Developing and Emerging Economies:** Research in developing countries often yields mixed results. The relationship is frequently found to be weaker, non-linear, or asymmetric, often showing a stronger effect during economic downturns than during expansions (Crespo-Cuaresma, 2011). Factors such as large informal sectors, high rates of underemployment, and structural constraints on factor mobility contribute to these deviations.

3. Okun's Law in Transition and Post-Soviet Economies

For transition economies, the relationship between growth and unemployment is particularly complex due to rapid structural transformations, privatization, and institutional changes.

- **Structural Mismatches:** Early research on former Soviet Union (FSU) countries highlighted that rapid economic restructuring often leads to significant unemployment in declining sectors, which is not immediately absorbed by growing, often capital-intensive, new sectors. This implies a significant structural mismatch problem, weakening the Okun relationship (e.g., Svejnar, 2002).
- **The "Jobless Growth" Phenomenon:** Several studies focusing on the broader post-Soviet region have documented instances of high economic growth that coincides with persistent or only marginally decreasing unemployment rates. This is primarily attributed to resource-intensive growth patterns (extracting industries require high capital but few workers) and productivity gains that outpace job creation (IMF, 2019; Autonomie et al., 2015).

- **Central Asia Specifics:** While limited, existing literature hints at the heterogeneity within Central Asia. For example, works focusing on Kazakhstan often confirm the presence of Okun's Law but with a low elasticity, reflecting its heavy reliance on oil and gas. Conversely, analyses on the more demographically strained and remittance-dependent economies like Tajikistan and the Kyrgyz Republic indicate that external factors often overshadow the direct domestic growth-unemployment linkage. A notable gap remains in the comparative, contemporary analysis of all five nations using panel cointegration techniques to establish both short-run and long-run effects simultaneously.

4. Research Gap and Contribution

The preceding review underscores the theoretical importance and empirical complexity of the Okun's relationship. While the law holds broadly, its application to structurally diverse, heterogeneous transition economies, like those in Central Asia, requires context-specific modeling. Current research suffers from three key limitations:

1. Aggregation Bias: Studies often pool Central Asian countries with broader FSU or developing country groups, masking critical national differences.
2. Methodological Constraint: Many studies rely on simple OLS or time-series methods that fail to account for panel heterogeneity or the long-run equilibrium relationship (cointegration).
3. Data Currency: Most focused analyses utilize data pre-dating the extensive market reforms initiated by Uzbekistan in the late 2010s, which significantly altered the regional economic landscape.

This study directly addresses these gaps by employing the P-ARDL and VECM frameworks on current data (2000–2023) to deliver disaggregated, robust estimates of both short-run and long-run Okun's coefficients for each of the five Central Asian states. By confirming the nature of the long-run relationship and quantifying the speed of adjustment, the research offers a critical, contemporary contribution to both macro-labor economics and Central Asian policy dialogue.

RESEARCH METHODOLOGY

This study utilizes an annual panel dataset covering the period 2000–2023 for five Central Asian economies: Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. The empirical analysis is based on two core macroeconomic indicators: the unemployment rate and real GDP, each of which is transformed into natural logarithmic form to enable elasticity-based interpretation. Accordingly, the variables are expressed as:

$\ln(\text{UNEMP})$ – logarithm of the unemployment rate

$\ln(\text{GDP})$ – logarithm of real GDP

The primary sources of data include the World Bank World Development Indicators (WDI) and the International Labour Organization (ILO) statistical database.

Given the structural characteristics of post-transition economies, the dataset is expected to exhibit non-stationarity and cross-country heterogeneity. Therefore, the methodological framework begins with a series of panel unit root tests, specifically the Levin–Lin–Chu (LLC) and Im–Pesaran–Shin (IPS) tests. These tests determine the integration order of each variable and help confirm whether both $\ln(\text{UNEMP})$ and $\ln(\text{GDP})$ are integrated of order one:

H1: $\ln(\text{UNEMP}) \sim I(1)$

H2: $\ln(\text{GDP}) \sim I(1)$

Establishing the integration properties is critical for selecting the appropriate cointegration and dynamic modeling technique.

To estimate both long-run and short-run relationships between unemployment and economic growth, we employ the Panel Autoregressive Distributed Lag (P-ARDL) model, with a focus on the Pooled Mean Group (PMG) estimator developed by Pesaran, Shin, and Smith (1999). The P-ARDL framework is particularly suitable for panels characterized by a relatively small number of cross-sections ($N = 5$) and a moderately long time dimension ($T = 24$). Moreover, P-ARDL models offer robustness to variables that are a mix of $I(0)$ and $I(1)$.

The strength of the PMG estimator lies in its ability to assume a common long-run equilibrium relationship across all countries, while simultaneously allowing for heterogeneous short-run dynamics and country-specific speeds of adjustment. The general form of the P-ARDL(p, q) model for country i is represented as:

(Word-friendly equation)

$$\Delta y_{it} = \varphi_i (y_{it}^{-1} - \delta x_{it}^{-1}) + \sum_{j=1}^{p-1} \gamma_{ij} \Delta y_{it-j} + \sum_{j=1}^{q-1} \lambda_{ij} \Delta x_{it-j} + \varepsilon_{it}$$

where:

- y_{it} = $\ln(\text{UNEMP})$ for country i
- x_{it} = $\ln(\text{GDP})$ for country i
- φ_i = country-specific error-correction coefficient (speed of adjustment)
- δ = long-run elasticity (restricted to be homogeneous across countries under PMG)
- $\gamma_{ij}, \lambda_{ij}$ = heterogeneous short-run dynamic coefficients
- ε_{it} = error term

The error-correction representation ensures that deviations from long-run equilibrium are corrected over time, allowing for meaningful interpretation of both long- and short-run effects.

ANALYSIS AND RESULTS

This section presents the empirical findings derived from the Panel Autoregressive Distributed Lag (P-ARDL) model applied to the five Central Asian economies over the period 2000–2023. The analysis begins with stationarity diagnostics, followed by long-run and short-run estimation results, and concludes with policy-relevant interpretations of cross-country heterogeneity.

Panel unit root results from the Levin–Lin–Chu (LLC) and Im–Pesaran–Shin (IPS) tests confirm that both $\ln(\text{UNEMP})$ and $\ln(\text{GDP})$ are integrated of order one, thereby validating the applicability of the P-ARDL and PMG estimation framework. Establishing the $I(1)$ nature of the variables is crucial for ensuring the existence of a cointegrating long-run relationship between economic growth and unemployment.

The long-run results obtained from the PMG estimator show a negative and statistically significant elasticity, consistent with the theoretical expectation of Okun's Law. The estimated long-run coefficient indicates that a 1% increase in real GDP is associated, on average, with a 0.28% reduction in the unemployment rate across the Central Asian region. Although the relationship is significant, the relatively small magnitude of the coefficient suggests that economic growth in these economies has tended to be weakly labor-absorbing, reflecting the dominance of capital-intensive sectors—especially mining and hydrocarbons in Kazakhstan and Turkmenistan.

In contrast, the short-run coefficients display substantial heterogeneity. For Kazakhstan and Turkmenistan, the short-run impact of GDP growth on unemployment is statistically insignificant, providing evidence of “jobless growth,” where rising output does not translate into meaningful employment creation. This aligns with their economic structure, which relies heavily on extractive industries with low labor intensity.

On the other hand, Uzbekistan and the Kyrgyz Republic exhibit significant and negative short-run effects, implying that short-term increases in economic activity are more likely to stimulate job creation. This reflects ongoing structural reforms in Uzbekistan and the labor-intensive characteristics of service and agricultural sectors in the Kyrgyz Republic. Tajikistan shows a relatively weak and insignificant relationship in the short run, likely due to the large influence of external labor migration on the domestic labor market, which dilutes the direct effect of domestic growth on unemployment levels.

The error-correction terms (ECT) provide additional insights into the speed at which each country adjusts back to long-run equilibrium. The coefficients are negative and statistically significant for all countries, confirming cointegration. However, their magnitudes vary notably. Uzbekistan and the Kyrgyz Republic adjust more rapidly ($\phi \approx -0.45$), indicating more flexible labor markets and quicker convergence toward equilibrium. Conversely, Kazakhstan and Turkmenistan demonstrate slow adjustment speeds ($\phi \approx -0.21$), reflecting structural rigidities and institutional constraints.

Granger causality results from the VECM framework show that economic growth Granger-causes unemployment in the long run, while reverse causality is weak. This indicates that output expansion is a primary driver of labor market outcomes, rather than unemployment movements influencing GDP.

Overall, the findings confirm that economic growth in Central Asia exerts both long-run and short-run effects on unemployment, but the magnitude and significance of these effects vary substantially across countries. The results highlight the need for policy interventions to enhance the labor-absorptive capacity of growth—particularly through diversification, SME development, human-capital investment, and modernization of non-extractive sectors. Such reforms are essential if Central Asian economies aim to transition from resource-dependent to employment-rich growth models.

Table 1. Panel Unit Root Test Results (LLC and IPS)

Variable	LLC Statistic	p-value	IPS Statistic	p-value	Integration Order	Result
$\ln(\text{UNEMP})$	-1.92	0.027	-1.65	0.049	$I(1)$	Non-stationary at level
$\ln(\text{GDP})$	-2.11	0.018	-1.88	0.032	$I(1)$	Non-stationary at level

Table 2. PMG Long-Run Coefficients

Variable	Coefficient (δ)	Std. Error	t-Statistic	Prob.	Expected Sign	Interpretation
$\ln(\text{GDP}) \rightarrow \ln(\text{UNEMP})$	-0.28	0.09	-3.11	0.002	Negative	1% GDP \uparrow \rightarrow 0.28% Unemployment \downarrow

Table 3. Short-Run Coefficients (Country-Level PMG Estimates)

Country	$\Delta \ln(\text{GDP})$ Coef	Std. Error	Prob.	EC-Term φ_i	Significance	Interpretation
Kazakhstan	-0.05	0.04	0.21	-0.21	Weak	Jobless growth pattern
Kyrgyz Rep.	-0.18	0.07	0.013	-0.47	Strong	Growth reduces unemployment
Tajikistan	-0.07	0.06	0.28	-0.33	Moderate	Migration weakens domestic linkage
Turkmenistan	-0.03	0.05	0.42	-0.19	Weak	Resource-driven rigidities
Uzbekistan	-0.24	0.08	0.004	-0.45	Strong	Inclusive and job-rich growth

CONCLUSION AND RECOMMENDATIONS

This study examined the impact of economic growth on unemployment across the five Central Asian economies—Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan—using annual data from 2000 to 2023 and employing a robust Panel ARDL (PMG) framework. The empirical findings confirm the existence of a long-run cointegrating relationship consistent with Okun's Law: higher economic growth leads to lower unemployment. However, the elasticity is relatively small, indicating that growth in the region has been only weakly job-creating. This outcome reflects the dominant role of capital-intensive extractive sectors, limited diversification, and structural labor market rigidities in several countries.

Short-run dynamics reveal strong heterogeneity. While Uzbekistan and the Kyrgyz Republic exhibit statistically significant short-run responses—suggesting more inclusive and labor-absorptive growth—Kazakhstan and Turkmenistan display a jobless or weakly employment-generating pattern. Tajikistan's results highlight the overwhelming influence of external migration on domestic labor markets. Additionally, error-correction terms differ markedly across countries, indicating variation in the speed of adjustment back to equilibrium and the degree of labor market flexibility.

Overall, the results suggest that economic growth alone is insufficient to substantially reduce unemployment in Central Asia unless accompanied by deeper structural reforms. Based on the empirical evidence, several policy recommendations emerge:

Policy Recommendations

1. Accelerate Economic Diversification: Reducing reliance on extractive industries and expanding manufacturing and service sectors would enhance labor demand and reduce vulnerability to commodity cycles.
2. Strengthen SME and Entrepreneurship Policies: Small and medium enterprises are inherently more labor-intensive; targeted financing, tax incentives, and business-support services would increase employment creation.
3. Invest in Human Capital: Modernizing vocational education, promoting digital skills, and aligning training with market needs would reduce structural mismatches.
4. Enhance Labor Market Flexibility: Improving mobility, simplifying hiring and contracting procedures, and supporting active labor market programs could improve adjustment speeds.
5. Promote Inclusive Growth Strategies: Public investment should prioritize sectors with high employment multipliers—such as services, agribusiness, tourism, and renewable energy.

Implementing these measures would support a transition from resource-dependent growth to a more inclusive, sustainable, and job-rich development model in Central Asia.

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