# Revisiting the Poverty: Economy Relationship— Evidence from Selected Central Asian Countries

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## Abstract

The present study attempts to examine the relationship between economic growth and poverty in Central Asian countries for the period 2000–2020. To achieve the objectives of the study, time series autoregressive distributed lag (ARDL) has been applied. The study confirms a cointegrating relationship among the variables across the countries. From the results, it can be concluded that financial development and economic growth have a positive impact on poverty reduction. This finding gives credence to the trickle-down effect of growth on the poor. However, the positive relationship between inequality and poverty suggests that inequality raises poverty by reducing economic development in all these countries. Furthermore, evidence from Kazakhstan and Kyrgyzstan indicates that inflation lowers poverty through decreased labour expenses, which in turn raises employment levels in these nations.

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## Introduction

In 1991, centrally planned economies in the former Soviet Union collapsed, relinquishing newly independent states—especially countries in Central Asia—to chase their way of post-communist economic transformation. Like other erstwhile Soviet republics, countries in the Central Asian Region (CAR) initially seemed to be fairly farsighted for transition towards a market-based economy. To some extent, they have performed well in the industrial and agricultural sectors. Some of these nations were also endowed with substantial natural resources, particularly with oil and other mineral reserves. Similarly, the labour force was relatively well educated and skilled (Campos & Coricelli, 2002). However, with the passage of time, these countries were not able to perform well as compared to Eastern European countries in terms of growth, poverty reduction, inequality, unemployment and other related problems. Figure 1 complements this argument as it indicates the relationship between income (GDP per capita) and poverty incidence (HCR as measured by $2.15 per day). Particularly, it shows that higher income levels are associated with a decline in poverty over time as some countries, including Finland, Belarus and Kazakhstan, have experienced higher income levels and a negligible incidence of poverty. In the case of Central Asia, many countries have experienced a negative association between income and poverty. However, Turkmenistan and Tajikistan have experienced lower income levels and higher poverty incidence over time.

It is important to mention here that with the passage of time, many countries of CAR have experienced heavy dependence on oil, natural gas, mining exports and remittances from migrant workers to accelerate their economic growth (Poghosyan, 2022). Further, the region observed a lack of economic diversification. Such an orientation has made these nations vulnerable to large external shocks in commodity prices, particularly in oil and natural gas, which transmits uncertainty to other sectors of the economy. These nations experienced more difficulty compared to other transition economies in shifting from a planned to a market
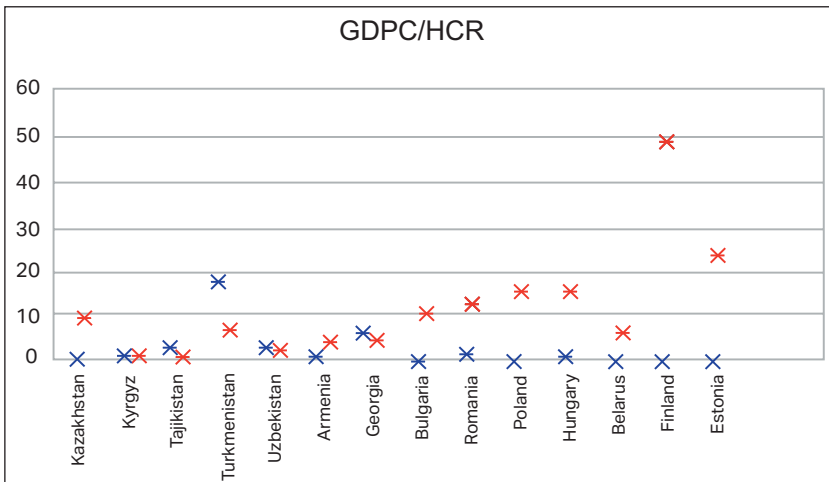


**Figure 1.** Income Levels and Poverty (2020).

**Source:** World Bank (2023).

economy. For instance, commercial and transportation channels that these landlocked countries had historically capitalised on were disrupted. Similarly, the budget transfers from Moscow abruptly stopped after independence. Further, the main problem in earlier times was of brain drain, with over a million Russians, many among them were highly skilled specialists, leaving Central Asia after its independence. It was due to this situation that the wave of economic reforms progressed at a slow pace across the region. The impact of all these factors was that the changeover was accompanied by widespread job losses, rapid economic collapse, extremely high inflation rates and a severe drop in real wages. Even in present times, poverty-related issues are increasing across the region.

A look at economic conditions in the region shows that Kazakhstan is one of the leading producers of crude oil and natural gas. The country possessed 5.12 metric tons (mt) of oil and natural gas in 2000, 79.2 mt in 2010, and 85.7 mt in 2020. The per capita GDP (at current prices) has increased from $1129 in 2000, $9070 in 2010, to $9172 in 2020 (World Bank, 2023). The economy falls under the category of upper-middle-income countries. The New Silk Route is also adding to its growth and development potential.

The world's fourth-largest natural gas reserves are found in Turkmenistan. The country also possesses substantial oil resources and is one of the leading producers of cotton. The per capita GDP (at current prices) has increased from $635 in 2000, $4,286 in 2010, to $7,946 in 2020 (World Bank, 2023). The government supplied natural gas, water and electricity to citizens for free between 1993 and 2017. Turkmenistan experienced high trade deficits from 2015 to 2017 as a result of a subsequent drop in cotton and hydrocarbon prices in 2014, which reduced export sale revenues. Furthermore, the load of foreign debt, along with the persistently low price of hydrocarbons and decline in demand for natural gas purchased by China, together with the pervasive poverty within the country, make the outlook for the economy dismal soon.

Tajikistan is the poorest country among Central Asian countries (World Bank, 2023). The economy is, to a large extent, dependent on remittances, which accounted for about 30% of its total income in 2019. The primary source of income is aluminium and cotton reserves, as well as remittances from migrant workers. However, the country observed high rates of unemployment. For example, the unemployment rate was 15.13% in 2000, 10.24% in 2010 and 7.58% in 2020, respectively (World Bank, 2023).

Kyrgyzstan is an agrarian economy, with primary sector value added (as a percentage of GDP) accounting for 34.18% in 2000, 17.44% in 2010 and 13.57% in 2020. On the other hand, the agricultural sector provided for 53% employment in 2000, 32.24% in 2020, and 19.30% in 2020 out of total employment. The per capita GDP increased from $250 in 2000, $880 in 2010, to $1,180 in 2020 (World Bank, 2023).

The economy of Kazakhstan and Turkmenistan is closely linked with oil wealth. In the case of Kazakhstan, for example, oil rents as a percentage of GDP accounted for 22.87% in 2000, 16.64% in 2010, and 9.33% in 2020. While in the case of Turkmenistan, oil rents as a percentage of GDP accounted for 29.27% in 2000, 14.87% in 2010, and 7.55% in 2019 (World Bank, 2023). At the same time, Kyrgyzstan is found to be an agriculture-based economy.

Such an economic orientation has led to lower growth performance of the stan nations over time. For example, the per capita GDP (current prices) growth rate is found to be a mere 1% in Kazakhstan, 1.12% in Turkmenistan, 1% in Tajikistan, and 1.06% in Kyrgyzstan, respectively, between 2000 and 2020 (World Bank, 2023).

Discussing the connection between economic growth, poverty, and inequality in light of established theory is the fundamental purpose of this study. The rest of the study is as the first section discusses literature review, followed by data source in the second section, methodology in the third section and results and discussion in the fourth section.

## Literature Review

### Economic Growth and Poverty

A powerful tool for alleviating poverty, which is the root cause of many socio-economic issues, is economic growth. These socio-economic issues include infant mortality, child malnutrition, restricted educational opportunities and the inability to participate in major economic activities. In line with empirical findings, it can be expected that economic expansion can drastically reduce poverty.

By international standards, Central Asia has done remarkably well in economic growth as well as in the reduction of poverty. However, economic expansion might not be a necessary prerequisite for reducing poverty on its own. The available literature suggests that a nation may experience positive economic growth without a trickle-down effect if income inequality rises. Therefore, to evaluate how economic growth affects the reduction of poverty, it is fundamental to analyse income distribution in an economy. This is because the relationship between poverty and growth can be positive or negative depending upon several factors, including income distribution. As mentioned by Perotti (1993), raising income level stimulates the economy to distribute resources across several domains, including healthcare, education and social welfare, so contributing significantly to the reduction of poverty. Similarly, Chen and Ravallion (1996) estimated that a reduction in poverty is associated with a high growth rate in income.

Ravallion (2001) and World Bank (2005) endeavoured to explain the importance of growth in poverty reduction. According to these findings, nations with a higher growth rate tend to experience a lower rate of poverty, whereas those with a low growth rate typically experience a rising rate of poverty. Ravallion (2001) found that if average income rises by 1%, poverty is reduced by 2.4–2.5 percentage points. Moreover, these studies also argue that improved income distribution within a country is conducive to poverty reduction.

### Inequality and Poverty

Income inequality is among the burning issues that have been extensively discussed in the economic literature. Discussing the ethical aspect of the subject, such as whether equality is desirable, fair and how much and what kind of equality should be pursued,

has constituted a significant portion of this conversation (Sen, 1992). The United Nations Development Programme Report (2007/2008) demonstrates that developing nations have the highest rate of income inequality. Many studies found that countries with a low level of GINI value develop differently from countries with a high level of GINI value. Findings show that wealth inequality affects a country's GDP and poverty rate (Fosu, 2010; Galor & Zeira, 1993). Moreover, many emerging nations in Latin America, Africa and transition zones either worsen poverty and inequality or do little to help the poor (Van der Hoeven, 2014).

## Financial Development and Poverty

There are numerous direct microeconomic ties between poverty alleviation and financial development, along with indirect macroeconomic links through economic growth. These connections are made possible if low-income people have easier access to finance, financial tools, services and institutions. Until the late 1980s, work on these microeconomic links was virtually non-existent. It was believed that only through public-sector banks and other institutions—financial development can be beneficial for the overall performance of the economy. Over time, however, it has been found that the private sector is a key player in financial development, enabling poverty reduction across the developing nations. Numerous studies have attempted to probe the link between monetary development, income disparity, poverty and economic growth, including Dollar and Kraay (2002), Honohan (2004) and Odhiambo (2009). The well-known idea is that a country's progress is enhanced by financial development since it allows for the efficient mobilisation of capital, which in turn helps with capital formation and overall development (Levine, 1997). However, these studies do not address the question of whether or not this economic expansion narrows the income disparity between the various social groups and trickles down to the deprived segments of society. Jalilian and Kirkpatrick (2005) investigated the link between rising income and poverty level. For every 1% improvement in financial development, low-income citizens in developing nations would see a 0.4% increase in their income. Beck et al. (2007) find that in nations with a relatively well-developed financial system, the income of the poorest 20% increases at a higher rate than the average GDP per capita. However, Danquah et al. (2017) found that though the development of the financial sector has had a favourable but insignificant impact on the eradication of poverty in case of Ghana. Similarly, Akhter et al. (2010) concluded that although financial market instability is detrimental to the impoverished, financial development aids in poverty alleviation. Odhiambo (2010) asserts that financial development seeks to alleviate poverty through the utilisation of private credit and various financial assets, based on an analysis of the relationship between poverty and financial development in Zambia from 1969 to 2006 using the autoregressive distributed lag (ARDL) technique. In the case of India, Sehrawat and Giri (2016) asserted that financial development and poverty alleviation are cointegrated. The impact of growth in financial sector on poverty alleviation and income inequality reduction in emerging countries was examined by Seven and Coskun

(2016). Despite the fact that financial development promotes economic progress, it may not necessarily help the poor in developing nations, according to their findings. They also claimed that stock market and banks do little to help alleviate poverty. Instead, a country's socioeconomic and political context determines the effect of financial development on poverty and inequality reduction.

### Inflation and Poverty

Classical economists believe that inflation acts as a tax on income of the poor as it reduces their real income and poses several challenges. For example, higher prices could erode real wages and savings across developing countries, thereby leaving the low- and middle-income households poorer than wealthier households. However, the final impact of inflation on poverty is contingent on the income composition, assets and consumption baskets of households. In all three categories, the inflation elasticity of poverty is high for poor households across the developing countries. A number of studies have found a positive and significant impact of inflation on poverty.

One of the economic issues that practically every nation faces is inflation, which is always discussed in relation to price increases since prices are a key indicator of inflation (Chandra, 2016). Simply put, inflation is the ongoing, generalised increase in prices. A price increase for one or two things alone cannot be considered inflation unless it affects the pricing of other goods and extends to them. The buying power of income decreases due to inflation, particularly for those with modest fixed incomes.

According to empirical findings, poverty is positively impacted by inflation. Talukdar (2012) investigates how inflation affects poverty in developing nations. Poverty and inflation have a positive correlation in lower- and upper-middle-income nations.

## Data Source

This study uses time series data from 2000 to 2020, which has been taken from the World Development Indicators and Poverty and Inequality Platform (2021). Poverty reduction is considered a dependent variable, whereas economic growth, financial development, income disparity and inflation are independent variables.

The present study uses consumer spending as a proxy of poverty (PHR) due to its more consistent and reliable recording than income (Danquah et al., 2017; Datt & Ravallion, 1992; Odhiambo, 2009, 2010; Sehrawat & Giri, 2016). It lines up with what the World Bank calls 'the inability to attain minimal standard of living' as determined by basic consumption demands. The present study also uses the Gini coefficient (GINI) to measure income disparity.

## Methodology

The available literature has evaluated financial development using a variety of proxy variables, such as wide money, quasi money and domestic credit as a proportion of GDP. Establishing an index as a single proxy for financial

development is crucial, given the interconnected nature of these components and the absence of a dedicated metric. The present study utilises the Financial Development Index (FDI), which is a composite of three variables commonly found in empirical studies: (a) private sector domestic credit relative to GDP; (b) broad money stock relative to GDP; (c) gross fixed capital formation as a percentage of GDP. The principal component analysis-based on financial development composite measures, which incorporates the above three parameters, adeptly addresses over-parameterisation and multi-collinearity (Stock & Watson, 2002). To construct the FDI, the following formula has been used:

$$I = \sum_{i=1}^{n} X_i \left( \sum_{j=1}^{n} |L_{ij}|.E_j \right) / \sum_{i=1}^{n} \left( \sum_{j=1}^{n} |L_{ij}|.E_j \right) \tag{1}$$

Where the index is represented by $I$, $X_i$ denotes the $i$-th Indicator; $L_{ij}$ in Equation (1), represents the factor loading of $i$-th variable on $j$-th factor; $E_j$ denotes the eigenvalue of $j$-th factor.

Jalilian and Kirkpatrick (2005) and Beck et al. (2007) concluded that GDPC is the best measure of economic growth. When the CPI rises by a certain proportion each year, inflation also rises. Low-income people may be more negatively affected by high inflation since they have fewer resources to deal with money problems (Easterly & Fischer, 2001). In line with the availability of data, the present study includes only Kazakhstan, Kyrgyzstan and Tajikistan.

## Model Specification

By employing the log-linear specification, impact of financial development, income inequality, inflation, and economic growth on poverty has been explored. Compared to traditional linear requirements, log-linear ones reduce dataset variability and yield more efficient results. The present study made use of the following economic model:

$$LnHCR_t = f(LnGDPC_t, LnGINI_t, LnFDI_t, LnINF_t) \tag{2}$$

The econometric specification of Equation (2) is:

$$LnHCR_t = \alpha_1 + \alpha_2 LnGDPC_t + \alpha_3 LnGINI_T + \alpha_4 LnFDI_t + \alpha_5 LnINF_t + e_t \tag{3}$$

where,

| | |
|---|---|
| $LnHCR_t$ | = log of headcount ratio |
| $LnGDPC_t$ | = log of GDP per capita at period $t$ |
| $LnGINI_t$ | = log of Gini coefficient |
| $LnFDI_t$ | = log of FDI |
| $LnINF_t$ | = log of the rate of inflation |
| $t$ | = time from 2000 to 2020 |
| $e_t$ | = error term |
| $a_t$ | = 2 to 5 represents the coefficient of the independent variables |

## ARDL Approach of Cointegration

Numerous econometric methodologies can be applied to investigate the effect of underlying factors on poverty. Engle and Granger (1987) and Johansen (1991) provided the concept of cointegration tests, which rely heavily on the stationarity of data. The Johansen cointegration test cannot be directly applied when the variables exhibit mixed integration orders of I(0) and I(1) or when any variable is non-stationary. Pesaran et al. (1999, 2001) formulated ARDL methodology to tackle these problems. This methodology surpasses alternative techniques for both mixed-order integration time series and non-stationary time series (Amin et al., 2020). This approach selects optimal lags for independent variables ($q$ lags) and variable of interest ($p$ lags) to clarify data-generating process within a general-to-specific modelling framework. Hence, this technique is more likely to minimise the skewed estimates brought about by concurrent causation between dependent and independent variables. Conventional asymptotic theory underpins the findings and ARDL consistently and credibly estimates the long-run coefficients, even with small samples. Pesaran et al. (1999) state that ARDL approach eliminates serial correlation and endogeneity. However, this model cannot be applied when the dataset is of I(2) order. The specific ARDL model for each nation used in the present study is as follows:

$$\Delta LnHCR_t = \alpha_0 + \sum_{i=1}^{n} \beta_1 \Delta LnGDPC_{t-i} + \sum_{i=1}^{n} \beta_2 \Delta LnGINI_{t-i} +$$
$$\sum_{i=1}^{n} \beta_3 \Delta LnFDI_{t-i} + \sum_{i=1}^{n} \beta_4 \Delta LnINF_{t-i} + \lambda_1 \Delta LnGDPC_{t-i} +$$
$$\lambda_2 \Delta LnGINI_{t-i} + \lambda_3 \Delta LnFDI_{t-i} + \lambda_4 \Delta LnINF_{t-i} + e_t \qquad (4)$$

where $\Delta$ is the first difference operator and $a_o$ is a constant. $\beta_i$ denotes short-run coefficients of model, while $\lambda_{vi}$ denotes long-run coefficients.

In order to verify if cointegration is present, bounds test compares the variables to null hypothesis $H_o$: $\lambda_i = 0$ (no cointegration). Coefficient estimates for the test can be obtained from Equation (4). If the variables are cointegrated, the Error-Correcting variant of the ARDL model is to be applied.

$$\Delta LnHCR_t = \alpha_0 + \sum_{i=1}^{n} \beta_1 \Delta LnGDPC_{t-i} + \sum_{i=1}^{n} \beta_2 \Delta LnGINI_{t-i} +$$
$$\sum_{i=1}^{n} \beta_3 \Delta LnFDI_{t-i} + \sum_{i=1}^{n} \beta_4 \Delta LnINF_{t-i} + \theta EC_{t-1} + e_t \qquad (5)$$

Where 'EC' stands error correction term $\theta$ is the symbol for adjustment parameter, which is also called speed of adjustment per year. Additionally, occurrence of cointegration among the variables is further supported by negative and significant coefficient of EC term.

## Empirical Results and Discussions

To determine the stationarity of a series, ADF test is most commonly used and has been applied in the present study at both levels and first difference. The results are presented in the Table 1 illustrates that the variables included are stationary at both the level and first difference, as indicated by *p* value of respective variables. which validates application of bounds test and ARDL model.

The first step is to apply bounds test to identify long-run relationship among the variables. Table 2 shows the *F*-statistic for long-run coefficients. The Schwartz Bayesian Criterion (SBC) has determined the optimal lag duration for each variable. The value of *F*-statistics confirms long-term relationship among the included variables.

### Long-run Results

The majority of the variables show the expected sign and are statistically significant, as presented in Table 3. In cases of Kazakhstan and Tajikistan, impact of GDPC on poverty reduction is negative and statistically significant. The results

**Table 1.** ADF Levels and First Difference Unit Root Test.

| | Kazakhstan | | Kyrgyzstan | | Tajikistan | |
|---|---|---|---|---|---|---|
| Variable | Level | First Difference | Level | First Difference | Level | First Difference |
| GDPC | −1.22205 | −4.29879 | −3.77602 | −6.09006 | −1.57521 | −4.33579 |
| | (0.6435) | (0.0041) | (0.0107) | (0.0001) | (0.4762) | (0.0035) |
| FDI | −2.06154 | −2.91909 | −0.66283 | −5.95396 | −1.15117 | −4.90471 |
| | (0.2607) | (0.0617) | (0.8334) | (0.0001) | (0.6738) | (0.0011) |
| GINI | −1.61741 | −7.02957 | −1.61777 | −6.78433 | −2.27309 | −4.61085 |
| | (0.4513) | (0.0000) | (0.4536) | (0.0000) | (0.1897) | (0.0030) |
| INF | −3.77756 | −5.76186 | −3.88726 | −5.5032 | −6.10629 | −3.12475 |
| | (0.0107) | (0.0002) | (0.0085) | (0.0004) | (0.0002) | (0.0496) |
| PHR | −2.42152 | −5.87891 | −3.78254 | −3.42987 | −2.7731 | −3.34819 |
| | (0.1537) | (0.0003) | (0.0111) | (0.0266) | (0.0809) | (0.0323) |

**Note:** Values in parentheses indicate *p* value.

**Table 2.** Significance of *F*-test for Cointegration.

| Model | Kazakhstan F-statistic | Kyrgyzstan F-statistic | Tajikistan F-statistic | Significance Level (%) | LCB | UCB |
|---|---|---|---|---|---|---|
| PHRt = *f* (FDIt, PGDPt, GINIt, INFt) | 29.117584 | 4.630824 | 8.5258564 | 10 | 2.2 | 3.09 |
| | | | | 5 | 2.56 | 3.49 |
| | | | | 1 | 3.29 | 4.37 |

**Note:** UCB: Upper critical bound values, LCB: Lower critical bound.

**Table 3.** Results of Long-run Estimates from the ARDL Model (Dependent Variable PHR).

| Variable | Kazakhstan | Kyrgyzstan | Tajikistan |
|---|---|---|---|
| LGINI | 3.961622*** | 1.499879*** | 7.509547** |
| | [6.170857] | [34.43744] | [2.241985] |
| LFDI | 1.235154*** | −2.862652*** | −1.014343** |
| | [5.807488] | [−13.97170] | [−2.175829] |
| LGDPC | −1.146768*** | 1.052325** | −0.176210** |
| | [−10.78844] | [9.037013] | [−2.109544] |
| LINF | −0.343433*** | −0.200256* | 0.434691*** |
| | [−4.345264] | [−5.196592] | [2.661546] |

**Notes:** ***, ** and * stands for 1%, 5% and 10% significance level.
The values in the square brackets indicate *t*-statistics.

indicate that 1% increase in GDPC leads to 1.14% and 0.17% reduction in poverty, respectively, in these countries. It is quite acceptable and aligns with findings of Islam (2003), which suggested that higher economic growth could boost employment, productivity, potentially resulting in higher income for the poor. But in the case of Kyrgyzstan, 1% increase in GDPC leads to 1.05% increase in PHR, which is in line with Todaro (1997), who explained that economic growth could either decrease or increase poverty. Similarly, GINI has positive impact on PHR in long run. The results indicate that GINI exerts large influence in Tajikistan and Kazakhstan, with 1% rise in GINI resulting in 7.50% and 3.96% increase in PHR in these countries, respectively. In Kyrgyzstan, 1% rise in the GINI coefficient results in a mere 1.49% increase in PHR. The data indicate that GINI significantly and positively influences PHR, suggesting that inequality exacerbates poverty. These findings align with Fosu (2010), which shows that inequality exerts a direct and positive influence on poverty, with heightened inequality exacerbating poverty levels.

In Kazakhstan, foreign direct investment exerts a substantial and favourable influence on PHR, wherein the poverty rate rises by 1.23% for every 1% increase in FDI. This confirms what Hazari and Mohan (2015) found that low-income groups see their welfare eroded as a consequence of capital accumulation, which leads to lower wages. As Kunieda, Nishimura, and Shibata (2018) show, financial liberalisation can widen wealth gaps around the world. In Kyrgyzstan and Tajikistan, 1% increase in FDI results in a fall of 2.8% and 1.01% in PHR, respectively. It suggests that financial liberalisation substantially influences poverty alleviation. Claessens and Perotti (2007) and Demirgüç-Kunt et al. (2008), among others, have shown that financial access is crucial to alleviating poverty and inequality. Financial instability, according to Jeanneney and Kpodar (2011), makes poverty worse. Inflation has a significant and negative impact in the case of Kazakhstan and Kyrgyzstan, where 1% increase in Inflation leads to 0.34% and 0.20% reductions in poverty. Chaudhry and Chaudhry (2008) have noted a similar direct correlation between poverty and inflation in Pakistan. A decrease in unemployment will be correlated with rising inflation, which could

help the poor more than others. Moreover, an increase in inflation lowers the poverty rate, according to Cutler and Katz (1991). Tajikistan shows a positive and significant relationship between INF and PHR, where 1% increase in INF leads to 0.43% increase in PHR. In the case of India, Datt and Ravallion (1992) found that a high inflation rate is associated with high poverty rate. According to Cardoso (1992), poverty is impacted by inflation in two ways: First, rise in inflation may reduce real disposable income. Second, nominal earnings of wage earners rise more slowly than the real costs of commodities they consume.

## Short-run Results

Table 4 presents the short-term results that align with long-run results. The findings indicate the positive impact of GINI in Kazakhstan and Tajikistan, while demonstrating a negative impact in Kyrgyzstan. The impact of GDPC on poverty is statistically significant and negative across all nations. The results indicate that 1% increase in GDPC leads to 4.08%, 1.49%, and 0.0017% decrease in PHR for Kazakhstan, Kyrgyzstan and Tajikistan, respectively. FDI exerts a substantial negative influence on PHR. The results indicate that 1% rise in FDI decreases 2.67%, 1.68%, and 0.26% PHR in these nations, respectively.

In addition, there is a significant and negative effect of INF on PHR, as 1% rise in INF results in a fall of 1.6%, 2.6% and 0.34% in PHR. The present study applies specific residual diagnostic procedures to yield robust results, even though the dependence, variance and covariance characteristics of the regression error term may influence these outcomes. We shall now commence diagnostic assessments.

**Table 4.** Short-run Estimates from ARDL Model (Dependent Variable PHR).

|  | Kazakhstan | Kyrgyzstan | Tajikistan |
|---|---|---|---|
|  | Coefficient | Coefficient | Coefficient |
| D(LGINI) | 3.014379*** | −1.104705*** | 0.913372** |
|  | [13.57453] | [−11.13202] | [2.375892] |
| D(LGDPC) | −4.088116*** | −1.490156*** | −0.001780* |
|  | [−22.05245] | [−26.21734] | [−0.532057] |
| D(LFDI) | −2.672852*** | −1.681518*** | −0.267148*** |
|  | [−11.45926] | [−15.04277] | [−8.485028] |
| D(LINF) | −0.579157*** | −0.086388** | −0.133532*** |
|  | [−3.586885] | [−11.42129] | [−10.00983] |
| CointEq(−1) | −1.686377*** | −2.633690*** | −0.340758*** |
|  | [−19.82643] | [−28.10036] | [−16.82511] |
| $R^2$ | 0.988865 | 0.997851 | 0.992115 |
| Adjusted $R^2$ | 0.980204 | 0.993122 | 0.983245 |
| SE of regression | 0.074654 | 0.020049 | 0.014890 |
| Durban–Watson test | 2.125229 | 2.728150 | 2.458933 |

**Note:** ***, ** and * stands for 1%, 5% and 10% significance level.

## Diagnostic Evaluation and Goodness of Fit

As shown in Table 4, the estimated models have a reasonable level of goodness of fit, as evaluated by adjusted $R^2$ and the Durbin–Watson test. By demonstrating predictive capabilities of 98%, 99%, and 99%, respectively, estimated ARDL-ECM models demonstrate that they are able to account for about 98% of variation in dependent variable in Kazakhstan, and 99% of variation in Kyrgyzstan and Tajikistan. The Durbin–Watson statistics are 2.1, 2.7 and 2.4, indicating that the models are free of autocorrelation issues.

Figures 2–4 show the result of cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) of recursive residuals obtained from nested subsamples of the data of Kazakhstan, Kyrgyzstan, and Tajikistan, respectively, to assess the stability of short-run and long-run ARDL model. With CUSUM and CUSUMSQ



The plot of cumulative sum of recursive residuals

Plot of cumulative sum of squares of recursive
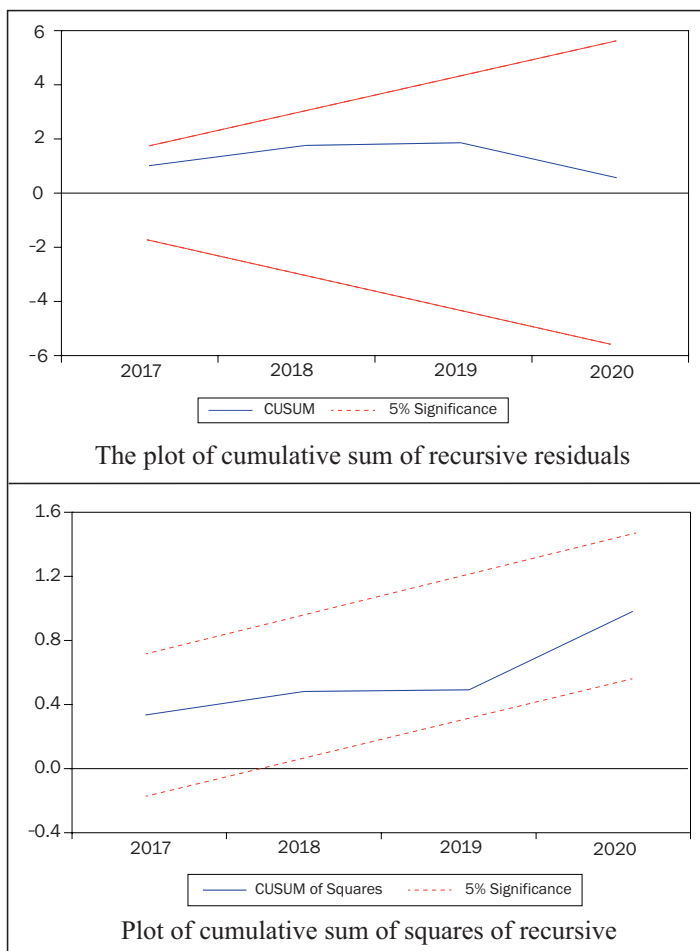
**Figure 2.** Stability Test of Kazakhstan.

**Source:** Authors' calculation.
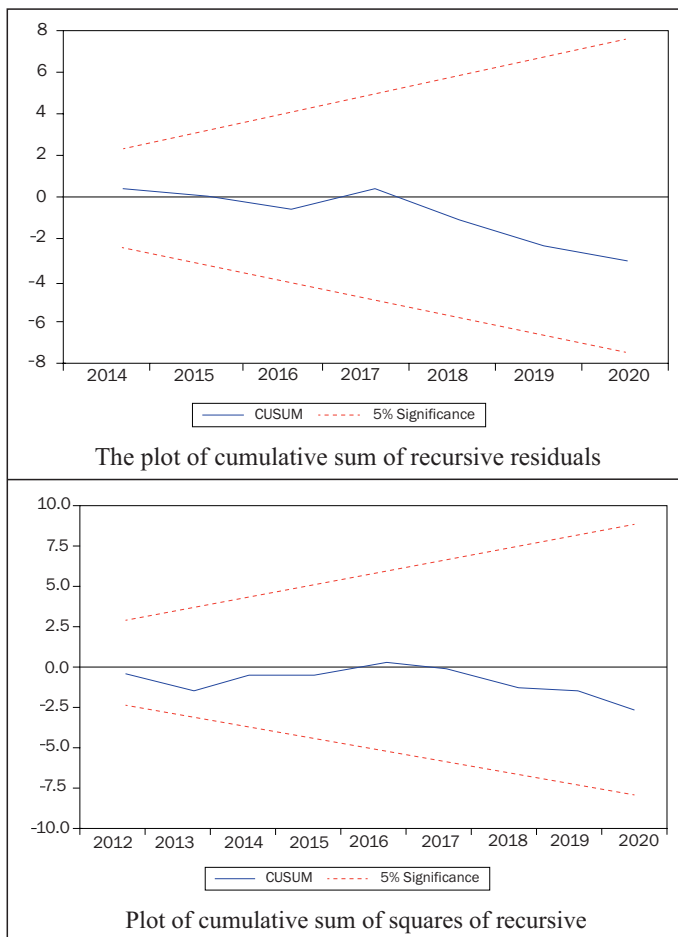
**Figure 3.** Stability Test of Kyrgyzstan.

**Source:** Authors' calculation.

values continuously falling below 5% critical thresholds, the figure shows that the ECM coefficient remains constant throughout the sample period. Based on all the evidence, it seems like the models are good for policy analysis because they have good statistical and theoretical properties.

## Conclusion

The present study attempted to investigate the poverty-economic relationship in Central Asian countries over 2000–2020. Particularly, it evaluates the impact of economic growth, income inequality, financial development and inflation on poverty levels. The present study applied the time series ARDL estimation
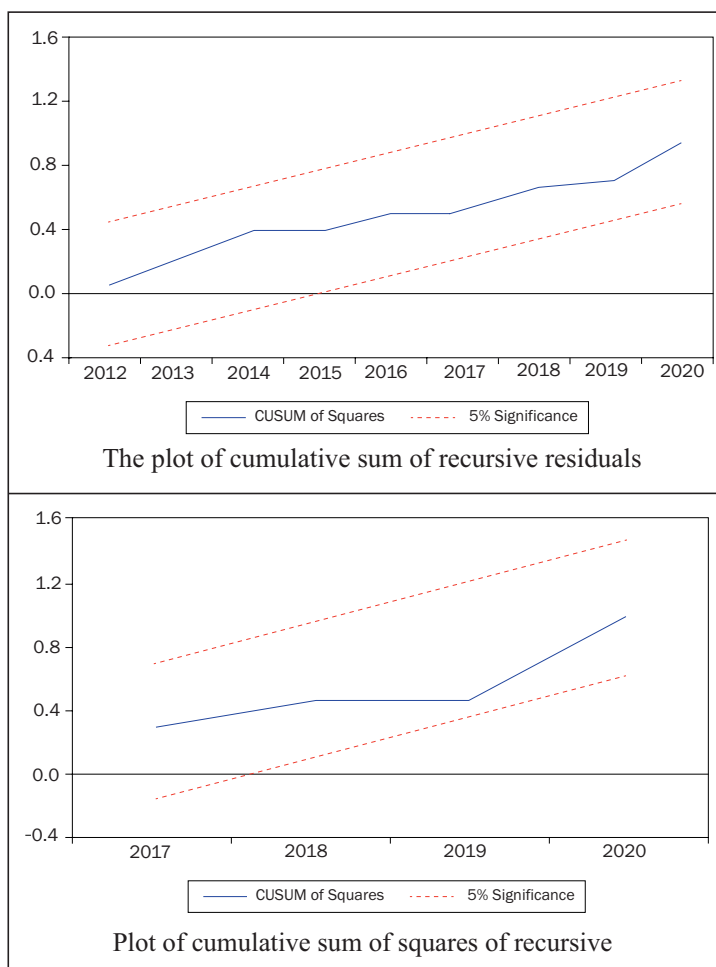
**Figure 4.** Stability Test of Tajikistan.

technique based on various unit root and cointegration pre-estimation tests. The findings of the study indicate a long-run cointegrating relationship. Economic growth exerts a significant and negative impact on poverty levels, indicating that economic expansion is necessary for poverty reduction. Similarly, income equality has a positive and significant impact on poverty, implying that inequality accentuates poverty levels in all these countries. Further, financial liberalisation significantly reduces poverty levels in Kyrgyzstan and Tajikistan. Inflation has a significant and negative impact in case of Kazakhstan and Kyrgyzstan. Based on these findings, several policy implications can be drawn to address poverty reduction and economic development in Kazakhstan, Kyrgyzstan and Tajikistan:

Promote pro-poor economic growth: Given that economic growth has a significant and negative impact on poverty, it is crucial to prioritise policies that

foster economic expansion in all three countries. The Government needs to implement measures aimed at attracting investment, improving infrastructure and supporting entrepreneurship and innovation. This may create employment opportunities, which in turn generate income and may contribute to poverty reduction.

Address income inequality: The positive and significant impact of income equality on poverty suggests that efforts to reduce inequality can contribute to poverty reduction. Policymakers need to implement redistributive measures such as progressive taxation, social protection programs and targeted subsidies to ensure a more equitable distribution of wealth and resources. Investing in education and skills training programs can also help enhance income mobility and reduce income disparities.

Financial liberalisation and access: The present study indicates that financial liberalisation has a positive effect on poverty, particularly in Kyrgyzstan and Tajikistan. Policymakers need to prioritise the development and regulation of inclusive financial systems that promote access to credit, savings and insurance services for the poor and vulnerable populations. This can be achieved by improving financial literacy, expanding microfinance initiatives and fostering competition in financial sector.

Manage inflation: Inflation has been found to have a significant and negative impact on poverty in Kazakhstan and Kyrgyzstan. Therefore, it is crucial to implement effective monetary policies to control inflation rates. Central banks need to focus on maintaining price stability through appropriate interest rate policies, prudent fiscal management and effective regulation of financial sector. Additionally, policymakers need to monitor and address factors contributing to inflation, such as supply-side constraints and external shocks.

## Declaration of Conflicting Interests

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