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Analyzing the Impact of Fiscal and Monetary Policies on Income Distribution in Central Asian Economies

Abstract: This study examines the impacts of macroeconomic policies (i.e. fiscal policy through government consumption spending and total tax revenue, and monetary policy through broad money and real interest rate) along with other regressors such as inflation, Gross Domestic Product (GDP) per capita, remittances, exchange rate, and financial development on income distribution in four Central Asian countries from 1995 to 2020. After conducting unit root tests, the Autoregressive Distributed Lag (ARDL)/Pooled Mean Group (PMG) approach was implemented for empirical analysis. The results show that both fiscal and monetary policies have positive and negative effects on income inequality. Moreover, inflation is found to increase income inequality, while financial development, higher levels of per capita income, and foreign remittances decrease inequality in the panel and individual country analyses. These findings suggest that coordinated policies, along with increased remittances and financial sector development, are needed to reduce income inequality.

Keywords: Fiscal policy, monetary policy, income distribution, ARDL/PMG, Central Asia

JEL classifications: E62, E63, D63.

1. Introduction

Income inequality refers to the uneven distribution of income among populations or groups. In today's world, income inequality is among the most contentious concerns, as it exists to a certain level across the globe (Muhibbullah & Das, 2019). Inequality in income and wealth has become increasingly obvious as a threat to economic stability and social cohesion. The growing levels of inequality in developing and developed economies have been consistently perceived. In this regard, extensive literature debates the factors determining income inequality (Andersen, Johannesen, Jørgensen & Peydro, 2021). Governments have focused heavily on addressing the problem of income inequality (Yellen, 2014), as it rose as a result of the 2008 global financial crisis and subsequent recession (Martinez-Vazquez, Moreno-Dodson & Vulovic, 2012). This evidence is also supported by Mahmood (2017), indicating that income inequality has risen rapidly in the post-financial-crisis period. Accordingly, this dramatic increase in income inequality causes poverty, unemployment, and worsens many other macroeconomic factors. Income inequality affects economies, families, societies, and communities differently. Evidence of increasing income and wealth inequality among developed and developing countries has generated debates regarding its economic implications. However, there is no consensus on the link between inequality and economic growth as increasing income inequality can be a serious economic issue (Domanski, Scatigna & Zabai, 2016).

Smith (1776, p.316) documented that "Wherever there is great prosperity, there is great inequality. For one very rich man, there must be at least five hundred poor, and the affluence of the few supposes the indigence of the many". Consequently, it is believed that income inequality is a complicated problem deeply embedded in most Asian countries, and it harms people's living standards. Though income inequality exists in all countries, there is a great visible disparity between the haves and have-nots in developed, developing, and emerging economies. Moreover, in developing countries, the gap between the haves and have-nots is comparatively wider than in developed countries. The unequal distribution of income widens the income gap and decreases interest in work, as well as causes high unemployment, political uncertainty, and massive corruption (Dehshiri, Pajouyan, Hosseini & Ghaffari, 2020). It is also claimed by Alvaredo and Gasparini (2015) that income disparity in emerging economies is now worse than it was three decades ago. These increasing trends in inequality bring an inefficiency in resources allocation, restrict aggregate demand, and reduce consumption and investment (Berg, Ostry, Tsangarides & Yakhshilikov, 2018). Moreover, more unequal distribution of income may also increase household debt, fuel asset market boom, and economic uncertainty (Perugini, Hölscher & Collie, 2016).

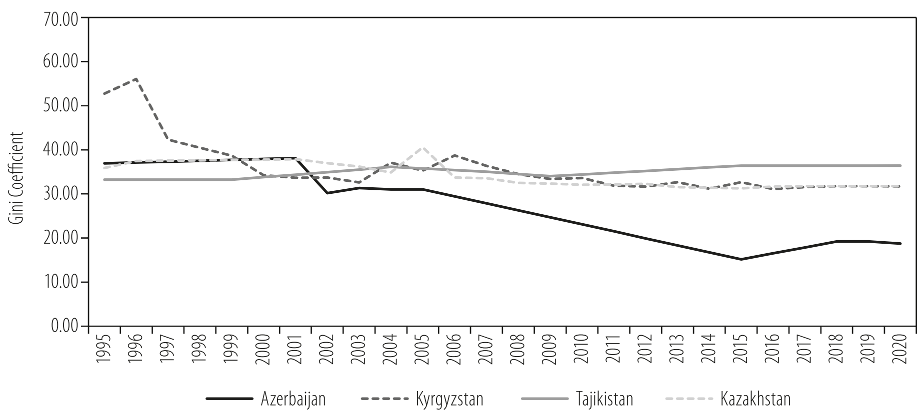
Income and wealth inequality can be influenced by monetary policy, whereas inequality could also affect the efficiency of monetary policy (O`Farrell & Rawdanowicz, 2017). Rising income inequality is becoming a significant issue, prompting the consideration of various fiscal policy indicators to address it. Monetary policy, on the other hand, can also influence income distribution; however, its income redistributive effects have received little attention (Davtyan, 2016). Political economy claims that certain parameters linking inequality and economic growth are commonly used to define the redistributive mechanism (Muinelo-Gallo & Roca-Sagales, 2011). The redistribution of income is implied in political economy arguments to be achieved through fiscal policy, including government expenditure and taxes. Additionally, income is also influenced by monetary policy. Monetary and fiscal policies regulate economic activities and serve significantly different macroeconomic goals, such as increasing the size of the economy and controlling inflation. However, they both have an impact on the same economic activities, including redistribution, and are constantly interconnected.

According to Coibion, Gorodnichenko, Kueng & Silvia (2017), the influence of monetary policy on the distribution of income is unclear as various types of the transmission of monetary policy function work in different directions. It is important to correctly grasp the distributional effects of monetary policy because determining its overall impact on income distribution and overall economic performance is unavoidable. Amaral (2017) mentioned that the Fed's monetary policy does not directly aim to reduce inequality but focuses on reducing unemployment, stabilizing prices, and establishing a reasonable long-term interest rate. Accordingly, changes in the different tools of monetary policy may influence income inequality indirectly. In their study, McKay and Wolf (2023, p.123), noted that "Monetary policy affects the consumption of an individual household by changing the prices, wages, interest rates, and opportunities it faces." Most monetary policies adopted by central banks aim to ensure price stability (Azam, 2023). In his study, Fabris (2024) explains that central banks have three main goals: price stability, financial stability, and stability in real economic growth. Nevertheless, the dilemma that remains is whether monetary policy must only focus on controlling prices or if its tools should also support other goals such as employment and economic growth.

The findings of existing empirical studies regarding the impact of monetary policy on income inequality remain elusive. However, many prior studies have documented the negative consequences of inequality on macroeconomic outcomes (Perugini et al., 2016). Every country aims to achieve inclusive and sustainable economic growth while boosting equity. Income disparity between the affluent and the destitute has been widening, necessitating inquiry into the causes of inequality and poverty, and the development of appropriate strategies to diminish poverty and reduce income disparity. Many countries have adopted fiscal policy to address widening income inequality and poverty (ADB, 2014).

Since the global financial crisis, central banks have used tight monetary policy and unconventional tools to combat sluggish growth and inflation. The widespread adoption of unconventional monetary policy tools and their possible influence on disparity has raised the attention of central banks' position in wealth & income inequalities (Saiki & Frost, 2020). Fiscal policy tools influence the income distribution in both short and long run. Taxes impact consumer and firm behaviours by changing the supply of labour, consumption, and investment decision, to minimize income inequality (Bakija, 2014). Accordingly, fiscal policy can influence the distribution of income, both positively and negatively, with specific impacts varying in each country's case. The income inequality in selected central Asian countries is shown in Figure 1.

Figure 1: Income inequality of selected Central Asian countries



Source: SWIID (2022)

Figure 1 clearly demonstrates the unequal distribution of incomes or wealth across households in Central Asian countries. Amaral (2017) claims that there is no clear consequence on the impacts of conventional monetary policy that appears from the consideration of hypothetical explanations through various channels. However, there is a need to measure these impacts in the data. Likewise, Martinez-Vazquez et al. (2012) argued that too little study has been carried out on how variation in taxes and government expenditures have truly affected income distribution, especially in the developing world. However, some research reveals that fiscal policies do impact trends in income distribution. Some prior studies, including that by Caminada & Goudwaard (2001), observed that decreases in government expenditure on social programs have resulted in less substantial welfare systems and sharp upsurges in income inequality. However, the causality has not been established in the UK and the Netherlands. Similar results on the impact of fiscal policy on social welfare and inequality have also been observed in the case of developing countries like Indonesia (Keuning & Thorbecke, 1989), and Latin America (Ocampo, 1998). Schuknecht and Tanzi (2005) revealed a weak relationship between changes in government expenditures and income disparity. Moreover, Harberger (2006) observed the overall ineffectiveness of taxes in income distribution.

This study intends to investigate the link between fiscal and monetary policies and income distribution in selected Central Asian countries. It also addresses two questions: (i) what is the effect of fiscal policy on income distribution? (ii) What is the impact of monetary policy on income distribution? The primary focus of this study is on the possible role of fiscal and monetary policies in income distribution, and to determine the extent to which changes in monetary and fiscal policies in the Central Asian countries have contributed to the ongoing worsening of income distribution patterns. Given the importance of income inequality and poverty, where the gap between the haves and have-nots widens gradually, conducting an empirical study to examine the impacts of fiscal and monetary policies on income distribution in four Central Asian countries over the period from 1995 to 2020 is indispensable. This study makes a novel contribution to the literature on the critical role of fiscal and monetary policy in income inequality in the context of the Central Asian region. The findings of this study will guide policymakers in mitigating income inequality through the effective implementation of fiscal and monetary policies.

The study is structured as follows. Section 2 reviews theoretical and empirical literature on the association between fiscal policy, monetary policy, and income distribution. Data description and empirical methodologies are presented in section 3. The empirical results with discussions are reported in section 4. Concluding remarks are presented in section 5.

2. The existing theoretical and empirical studies

Theoretical Literature

One of the world's most serious issues is rising income inequality. The key role that income distribution plays on the macroeconomic level of a country has been primarily discussed in a seminal study by Kuznets (1955) where he tried to establish the association between the growth rate in income and income inequality. The World Inequality Report 2022 highlights that global wealth inequality is more pronounced than income inequality. The poorest half of the global population owns just 2% of the total wealth, while the richest 10% possess 76% of all wealth (Chancel, Piketty, Saez, Zucman et al., 2022). Inequality can rise or fall as a result of the quantitative effect of different policy tools. Different researchers have different opinions on whether and how much unconventional monetary policy causes inequality. Monetary policy`s influence on inflation can also influence inequality. In the case of income inequality, theoretical processes and empirical findings are ambiguous regarding the nature of the impacts, and they usually show that the impacts are insignificant for low-income countries with low inflation (Bulir, 2001).

Many prior studies have theoretically validated the relationship between monetary policy tools and income inequality (Coibion et al., 2017; Bulir, 2001). The monetary authorities do not have direct control over inflation or output and employment; instead, they indirectly affect them by changing interest rates/policy rates, buying and selling bonds in open market operations, and increasing or decreasing bank rates for bank reserves to control the money supply (Feenstra & Hanson, 2008). In their study, Kharroubi, Kohlscheen, Lombardi, Mojon & Pereira da Silva (2021) highlighted that inequality decreases the efficiency of monetary policy. The various effects of accommodative monetary conditions on heterogeneous households can indeed influence monetary policy transmission when income levels are high. Wealthier families are less likely to consume, and thus their spending is even less responsive to monetary stimulus. Lower-income families, on the other hand, do not benefit from extremely easy credit conditions since they have little or no assets or appropriate credit scores, making it impossible for them to borrow.

For a long time, fiscal policy was considered to be an effective tool for affecting income and wealth disparity, total demand, and the ability of growth to increase production (Musgrave, 1959). The effectiveness of fiscal policy on income inequality has been limited by Neo-Classical growth models, which imply that fiscal policy has only a short-term effect on GDP, making it impossible to assess the influence of fiscal policy on income disparity in an economy impossible (Ramos and Roca-Sagales, 2008). However, if taxes are regressive, then this expenditure will not help to mitigate inequality; but if taxes are progressive then this spending will help to reduce inequality (Ali & Ahmad, 2010).

Empirical Literature

Even though the monetary policy has been neglected as a driver of growing income inequality, there were few empirical studies on the relationship of monetary policy with income inequality. For example, in the case of Korea, Yue (2011) found that income inequality and economic growth had had a long-run link during 1980–2002. In the case of Japan, Saiki and Frost (2014) found that unconventional monetary policy had enhanced inequality from 1981 to 2008. Davtyan (2016) revealed that contractionary monetary policy reduces income disparity in the United State of America during 1979-2012. Coibion et al. (2017) observed that expansionary monetary policy reduces inequality in the U.S. Munir and Sultan (2017) concluded that per capita GDP and income disparity has a positive association in India and Pakistan (1973–2015). In the cases of OECD countries, O`Farrell and Rawdanowicz (2017) concluded that there is a little impact of unconventional monetary policy on inequality. In their study, Mumtaz and Theophilpoulou (2017) observed that contractionary monetary policy rises income inequality in the United Kingdom (1969–2012). The study of Adeleye (2020) observed that interest rate had reduced inequality in Nigeria (1980–2015). In the long run, however, they showed that smart (prudent) monetary policy focused on low inflation and constant economic growth is related to increased living standards of poor people and higher income inequality (Park, 2021).

Similarly, Martinez-Vazquez et al. (2012) revealed that in a sample of 150 countries over 1970–2006, both progressive personal and corporate income taxes had diminished inequality of income. They also observed that higher public spending on wellbeing, health, education, and housing had a favourable effect on income inequality. They concluded that both taxes and public expenditures had a significant influence on the Gini coefficient. In the case of Pakistan, Khan and Hashmi (2015) explored that development expenditure reduces income disparity. Cevik and Correa-Caro (2015) showed that income inequality had been increased by government expenditure in China and other 33 countries during 1980–2013. They also highlighted that tax reduced income disparity. Raza, Shahbaz & Paramati (2017) revealed that the effect of military expenditure on income inequality had been positive in Pakistan during 1972–2012. Martínez-Aguilar, Fuchs, Ortiz-Juarez & Carmen (2017) found four results that indicated the overall positive net impact of fiscal interventions on inequality and poverty in Chile during 2013. First, subsidies have a positive, yet small impact effect on inequality and poverty, while direct handovers are progressive, balancing, and decreasing the poverty headcount by 4-5 percentage points. Second, though social contributions are unbalancing and poverty-growing, direct taxes on personal income are balancing and poverty-impartial, while indirect taxes are poverty-growing. Third, social expenditure on tertiary education is marginally balancing but it is not pro-poor, opposing to the impacts of social expenditure on health, basic and secondary education, which are not only balancing but also pro-poor. Finally, the extent of monetary fiscal benefits is substantially higher than that of fiscal solvency.

In their study, Shahbaz, Bhattacharya & Mahalik (2017) examined the impacts of financial development along with other regressors on income inequality in Kazakhstan (1990–2014). They found that income inequality was reduced by financial development in Kazakhstan. Balseven and Tugcu (2017) found that in developing countries, the effect of economic growth on income distribution had been negative, while in developed countries the effect had been positive for 17 developed and 30 developing countries (1990–2014). The authors also disclosed that tax revenue reduced income disparity in developing countries, while in advanced countries, social benefit reduced income inequality. Alamanda (2020) found that infrastructure spending harmed income disparity, whereas social aid and subsidy had an insignificant effect on income inequality in Indonesia (2005–2017). Aman, Ahmad & Saleem (2021) observed a significant and positive link between income inequality and economic growth, while, FDI inflows and exports had a negative link with income inequality in 36 Asian economies (2001–2019). In their study, Digdowiseiso, Murshed & Bergh (2022) found that fiscal decentralization had a significant impact on ethnic inequality and distribution of income in 33 developing economies (1990–2014). Khan and Azam Khan (2023) found that money supply, GDP per capita, and FDI had a negative effect, while the inflation rate had a positive and significant effect on income inequality in ten African and Asian developing countries (1990–2020). The empirical findings of Azam Khan (2024) shows that strengthening an inclusive financial system was vital for lowering income inequality and poverty in five SAARC economies (2004–2021).

The foregoing studies that examined the effect of fiscal and monetary policy on income distribution have focused on developed and some developing countries. However, no perceptible study exists on the impact of fiscal and monetary policies on income distribution concerning the Central Asian countries. Thus, the focus of this study is on Central Asian countries to investigate the influence of fiscal and monetary policy on income distribution using updated data and a holistic empirical strategy.

Table 1: Selected previous studies on the impact of fiscal and monetary policies on income distribution

Author(s)	Data, Countries, Method	Regressand	Regressors	Findings
Khan and Padda (2021)	2000–2017, Pakistan, Instrumental Variable, Fixed-effect	Income inequality	Total tax, indirect tax, fiscal deficit, development outlay, human capital Direct tax, current outlay, GDP per capita, civil liberty	(+) (-)
Indongo and Robinson (2021)	1996–2016, Namibia, ARDL model	Income inequality	Government spending, Tax on income and wealth Tax on products/VAT; corporate income tax; customs, excise duties, Government spending on health	(-) (+)
Hayrullahoglu and Tuzun (2020)	2002–2019, Turkey and OECD, PARDL	Income inequality	Inflation, and unemployment Tax revenue and GDP per capita;	(+) (-)
Taghizadeh–Hesary, Yoshino & Shimizu (2020)	2002Q1–2017Q3, Japan, VAR, VECM	Income inequality	Money supply (M1), interest rate Total tax, and real GDP	(+) (-)
Berisha, Gupta & Meszaros (2020)	2001–2015, CCE, MG, BRICS	Income inequality	Inflation, Income, Interest rate	(+)
Law and Soon (2020)	1987– 2014, 65 DC and LDCs, GMM	Income inequality	Inflation, trade openness, financial development, Institutional quality; unemployment.	(+) (-)
Cevik and Correa–Caro (2020)	1980–2013, 33 countries with China, IV, 2SLS, GMM	Income inequality	Government expenditure Trade openness, Tax revenue, Human capital, financial development)	(-) (+)
Yoshino, Taghizadeh-Hesary & Shimizu (2018)	2002Q1–2016Q4, Japan, VAR, VECM	Income inequality	Money stock (M1), stock price index Real GDP, government income tax	(+) (-)
Siami-Namini and Hudson (2019)	1990–2014, 24 DCs and 66 LDCs, VECM, Toda Yamamoto	Income inequality	GDP per capita, Inflation, urbanization index Unemployment, and trade openness	(-) (+)
Monnin (2014)	1971–2010, 10 OECD countries, Pooled regression	Income inequality	Inflation, GDP per capita, union density, Unemployment, trade openness skill-based technological changes,	(-) (+)
Muinelo-Gallo & Roca-Sagales (2013)	1972–2006, 21 high income OCED, SUR SEM	Income inequality	Distributive expenditure, and direct tax	(-)

Source: Authors` compilation

3. The data and empirical methodology

The Empirical Model

Kuznets (1955) established a relationship between economic growth and income inequality, known as the Kuznets curve, a hypothetical curve that depicts how economic growth and income inequality interact. According to the Kuznets curve, as economies grow and income levels rise, income inequality initially increases, then reaches a peak, and eventually decreases after certain key development stages and income levels. This research focuses on four Central Asian countries: Azerbaijan, Kazakhstan, Kyrgyzstan, and Tajikistan. To investigate the impact of fiscal and monetary policies on income distribution, we use a multivariate regression model based on prior studies (including Furceri, Loungani, Ostry & Pizzuto, 2021; Siami-Namini & Hudson, 2019; Azam & Raza, 2018; Azam Khan, 2024).

$$\mathrm{Gini}_{it} = \beta_0 + \beta_1 \mathrm{M2}_{it} + \beta_2 \mathrm{Y}_{it} + \beta_3 \mathrm{P}_{it} + \beta_4 \mathrm{ER}_{it} + \beta_5 \mathrm{RR}_{it} + \beta_6 \mathrm{GE}_{it} + \beta_7 \mathrm{TTR}_{it} + \beta_8 \mathrm{RM}_{it} + \beta_9 \mathrm{FD}_{it} + \mu_{it} \quad (1)$$

Where $\beta_1 \ldots \beta_9$ represent the slope coefficients, and the term β_0 is the intercept. $Gini, M2, Y, P, ER, RR, GEX, TTR, RM$ and FD represents income inequality; broad money (% of GDP), real GDP per capita, Inflation rate, real effective exchange rate, real interest rate (%), general government final consumption spending (% of GDP), total tax revenue (% of GDP), foreign remittances inflows, and financial development index respectively. Lastly, μ_{it} represent the stochastic error term.

On the monetary side, Saiki and Frost, (2014) show that income inequality is increased by expansionary monetary policy, while Coibion et al. (2017) reveal that inequality is decreased by expansionary monetary policy. Accordingly, this study hypothesizes that expansionary monetary through increased money supply, may exacerbate inequality. Similarly, many studies (including, Adeleye, 2020; Maraşlı, 2016) have found that interest rates have a significant negative effect on income inequality on the fiscal side, research studies have concluded that government expenditures, particularly infrastructure expenditure, have a negative effect on income inequality (Alamanda, 2020), and tax revenue also exhibits a negative relationship with income inequality (Hayrullahoglu & Tuzun, 2020; Taghizadeh-Hesary et al., 2020).

Further, many studies have noted mixed effects of GDP per capita on income inequality, with some showing positive relationships and others negative relationships (Munir & Sultan, 2017; Hayrullahoglu & Tuzun, 2020). However, an increase in per capita GDP is often considered a positive indicator of economic progress. Therefore, this study hypothesizes a negative link between GDP per capita and income inequality. Furthermore, previous literature has shown a positive link between inflation with income inequality (Berisha et al., 2020; Law & Soon, 2020; Bulir, 2001). Consequently, this study postulates that a rise in inflation will increase income inequality significantly. Moreover, some of the empirical research favours the argument that exchange rate and income inequality have a positive relationship (for instance, Deyshappriya (2017). In contrast, the empirical study revealed a negative link between these variables, indicating that an increase in the exchange rate decreases income inequality. Additionally, Kóczán & Loyola, (2021) and Bang, Mitra & Wunnava (2016) argue that foreign remittances decrease income inequality. Similarly, Demirguc-Kunt and Levine (2010) have argued that financial development has a negative effect on income inequality.

In Eq. (1), we hypothesized that expansionary monetary policy through money supply helps to mitigate increases in income inequality, and fiscal policy through government expenditures reduces it, while tax revenue increases income inequality. We also hypothesized that the effect of GDP per capita, foreign remittances, and financial development has a negative link with income inequality, while the exchange rate and inflation rate have a positive link with income inequality.

Data and its sources

This study uses annual data from four selected Central Asian countries from 1995 to 2020. The data on income inequality has been obtained from the Standardized World Income Inequality Database (SWIID, 2021). However, Broad money, GDP per capita, inflation, government expenditure, and remittances data are sourced from World Development Indicators (WDI, 2022). Meanwhile, data for Real interest rates are obtained from International Monetary Fund (IMF, 2022), while the real effective exchange rate data is sourced from Bruegel (Darvas, 2021). The total tax revenue data has been collected from the International Centre for Tax and Development (ICTD, 2022). Financial development data are obtained from World Bank global financial development (2021). Further, we create an index of financial development for four central Asian countries by using the principal component approach (PCA) on the major two proxies of financial development i.e., Liquid Liabilities and Private credit by deposit money.

Empirical Strategy

Construction of financial development index

There are two types of approaches used in the literature to examine the effect of financial reform on the effectiveness of any economy. Firstly, researchers have used various proxies of financial sector development to assess the impact of different financial reforms qualities and characteristics on economic performance (see Hye, 2011; Ahmed, 2007). In their study, Hye and Islam (2013) explain that some scholars used the principal component approach to create a financial development index for their economies using the major proxies of financial sector development. This study employed the principal component approach to construct the financial development index for four (4) central Asian countries by using the principal component analysis (PCA) on two major proxies of financial development available in the literature: Liquid Liabilities and Private credit by deposit money. The PCA is a multivariate method for analyzing associations between multiple dependent variables. This PCA method is commonly employed in various field of research (Agenor, 2004). Following the standard procedure of PCA, the principal components are categorized by Eigenvalues, which are equal to the component variance, in descending order. It's worth noting that the Eigenvectors all have the same length (see Table 2).

Table 2: Construction of financial development index

Number	Value	Difference	Proportion	Cumulative value	Cumulative proportion
1	1.73984	1.47969	0.8699		0.8699
2	0.260157		0.1301		1.0000
Eigen vectors (loading)					
Variables	PC1				PC2
ll	0.7071				0.7071
pcd	0.7071				-0.7071

Source: Authors` computation

Unit root test

The non-stationary characteristic of variables is very well recognized in the extant literature, which can then be minimized by transforming them to 1^{st} difference. Regressing a random walk series on another, according to Datta and Mukhopadhyay (2011), would produce an incorrect result. In this regard, the Augmented Dickey-Fuller (ADF) approach, proposed by (Dickey & Fuller, 1979; 1981), is applied to detect the non-stationarity. The ADF technique is used to determine the stationarity of variables, which guides the selection of the most appropriate techniques for this investigation. The ADF test is based on the following regression.

$$\Delta\gamma_t = \beta_0 + \gamma_t + \delta\gamma_{t-1} + \Sigma_{t-i}^{n}\alpha_t\Delta\gamma_{t-i} + \mu_t \quad (2)$$

The test assumes that the coefficient of the level lagged variable in Eq. (2) should be zero for stationarity i.e., δ=0, and for unit root δ=1. Whenever the null hypothesis is failed to be rejected, then the series is stationary and when the null hypothesis is rejected, the series is non-stationary.

Panel unit root test

For panel data analysis, Levin, Lin & James Chu (2002) and Im, Pesaran & Shin (2003) proposed a panel unit root method. According to Mercan, Gocer, Bulut & Dam (2013), these techniques (LLC and IPS) are based on the model given below as Eq. (3).

$$\Delta\gamma_{it} = \beta_i\gamma_{it-1} + \Sigma_{j=1}^{n}\alpha_{ij}\Delta\gamma_{it-j} + \chi_{it}\sigma + \mu_{it} \qquad (3)$$

Levin et al. and Im et al. tests have the null hypothesis that "for all cross-section unit $\beta_i = 0$ (nonstationary)" against the alternative of "for relatively one-unit $\beta_i < 0$ (stationary)".

If the considered variables are found to be a mixture of *I*(0) and *I*(1), the panel Autoregressive Distributed Lag (ARDL) approach is applicable. Alternatively, if all variables are stationary at 1st difference (i.e., *I*(1)), we can also apply the panel ARDL model.

The ARDL Model

To assess the robustness of the estimations, the pooled mean group (PMG) estimator introduced by Pesaran & Shin (1999) and Pesaran, Shin & Smith (1999; 2001) is employed. According Pesaran et al., (2001) the ARDL method proposed in Pesaran and Shin (1999) is valid regardless of whether variables are purely I(0), I(1), or mutually cointegrated. According to Pesaran et al. (2001), the ARDL approach has numerous advantages over other co-integration approaches: (i) it efficiently examines the short- and long-term association among various variables that do not have the same integration order. Assuming that such variables are stationary in I(0) and I(1). (ii) ARDL approach can eliminate issues like omitted variables and auto-correlation. (iii) This approach can be advantageous in situations with a limited sample size. The ARDL approach, notably the Pooled Mean Group estimator, gives accurate coefficients despite the possibility of endogeneity in response lag regressors. According to Pesaran et al. (1999), the ARDL model`s unrestricted error correction for the response variable (GINI) can be expressed as follows.

$$\mathrm{GINI}_{i,t} = \Sigma_{j=1}^{p}\delta_{ij}\,\mathrm{GINI}_{i,t-j} + \Sigma_{j=0}^{q}\sigma_{ij}X_{i,t-j} + \mu_i + \epsilon_{it} \qquad (4)$$

The subscript i and t in equation (4) denote the country (group) and time, accordingly. As a result, the time period t= 1,…T (1995–2020) and countries i = 1,… N (in this situation, N=4). GINI is income inequality as a dependent variable;

X (K_x 1) is the independent variables such as broad money (M2), GDP per capita, inflation, real effective exchange rate, real interest rate, Government expenditure, total tax revenue, remittances, and financial development for country i; ui represents fixed effects. δ_{ij} indicates the coefficient of lagged dependent variable; 6ij is (K_x 1) coefficient of lagged explanatory variables, and ϵ denotes error term. T must be large enough so that each country may be calculated individually.

The reparametrized form of the Equation shown below can be used to accomplish the study`s set of goals, which are dependent on the nature of the data.

$$\Delta GINI_{it} = \partial GINI_{i,t-1} + \beta_i Y_{it} + \Sigma_{j=1}^{p-1} \delta_{i,j} \Delta GINI_{i,t-j} + \Sigma_{j=0}^{q-1} \varphi_{ij} \Delta Y_{i,t-j} + u_i + \epsilon_{i,t} \quad (5)$$

Where, $\partial_i = -(1 - \Sigma_{j=1}^{p} \delta_{i,j}),\ \beta_i + = \Sigma_{j=0}^{q} \varphi_{i,j}$

$\delta_{it} = -\Sigma_{m=j+1}^{p} \delta_{im}$ j = 1,2,……, p-1. (6)

and

$\varphi_{it} = -\Sigma_{m=j+1}^{p} \varphi_{im}$ j = 1,2…. q -1.

∂ in equation (5) is the coefficient of the speed of adjustment towards the long-run equilibrium.

4. Results and discussion

Descriptive statistics and correlation matrix analysis based on the panel data from 1995–2020 are given in Table 3. The maximum value of Gini is 56.05 and the minimum value is 15.16. Moreover, the maximum value of broad money (M2) is 47.67 and the minimum value is 6.72. The maximum value of GDP per capita is 11402.76 and the minimum value is 383.60. The descriptive statistics in Table 3 also indicate that the maximum value of inflation is 201.23 and the minimum value is -26.35. However, the maximum value of the real effective exchange rate is 139.56 and the minimum value is 65.34. The maximum value of the real interest rate is 60.00 and the minimum value is -8.15. The descriptive statistics in Table 3 reveal that the maximum value of government expenditure is 20.10 and the minimum value is 8.26. Furthermore, the maximum value of total tax revenue is 28.15 and the minimum value is 5.10. In addition, the maximum value of remittances is 2.42 and the minimum value is 44.12. Moreover, the maximum value of the financial development index is 3.16 and the minimum value is -1.45.

Table 3: Descriptive statistics/ correlation matrix

	Gini	M2	Y	P	ER	RR	GE	TTR	RM	FD
Mean	33.02000	24.19218	3252.636	87.81414	100.8688	14.85400	13.22472	18.32210	9.876651	1.73E-08
Median	33.69000	22.54463	1187.525	81.91755	100.0000	12.94338	12.22873	17.81790	2.423353	-0.264918
Maximum	56.05000	47.67290	11402.76	201.2394	139.5600	60.00000	20.10585	28.15691	44.12622	3.166695
Minimum	15.16000	6.723581	383.6092	-26.35286	65.34000	-8.150463	8.264269	5.100491	-14.25240	-1.451216
Std. Dev.	6.359852	10.65711	3283.850	50.73734	15.23632	11.99940	3.280203	4.773132	14.38233	1.000000
Skewness	-0.433630	0.154044	1.115360	0.191937	0.276197	0.945834	0.479847	-0.053047	0.938553	1.172822
Gini	1									
M2	-0.4532	1								
Y	-0.3446	0.4845	1							
P	-0.4342	0.5947	0.3787	1						
ER	-0.2556	0.1149	-0.1868	-0.2061	1					
RR	0.2128	-0.1654	-0.1373	-0.2347	-0.1082	1				
GE	0.3029	0.0831	-0.4767	-0.1223	0.0366	0.3438	1			
TTR	-0.0432	0.4269	0.2378	0.4662	-0.0909	-0.1613	0.0443	1		
RM	0.0894	0.0696	-0.4368	0.4651	0.1452	-0.2001	0.1876	0.4514	1	
FD	-0.3113	0.6791	0.6851	0.4184	0.1534	-0.3125	-0.3426	0.4718	-0.0308	1

Source: Authors` computation

A summary of the unit root tests analysis is presented in Table 4a. The results of the unit root test in Azerbaijan revealed that the Gini coefficient, real interest rate, total tax revenue, and financial development index are stationary at the level, whereas broad money, GDP per capita, inflation, real effective exchange rate, general government final expenditure, and remittances are stationary at the 1st difference. The results of the unit root test of Kazakhstan show that the Gini coefficient, inflation, real interest rate, government final expenditure, and remittances are stationary at the level, while broad money, GDP per capita, real effective exchange rate, total tax revenue, and financial development index are stationary at the 1st difference. Similarly, in the case of Kyrgyzstan, the unit result demonstrates that at the level, the Gini coefficient, broad money, inflation, real interest rate, general government final expenditure, total tax revenue, and financial development index are stationary, whereas GDP per capita, real effective exchange rate, and remittances rate are stationary at the 1st difference. Moreover, in Tajikistan, the unit root test also found that the Gini coefficient, inflation, real effective exchange rate, and financial development index are stationary at the level, while the other variables, broad money, GDP per capita, real interest rate, general government final expenditure, total tax revenue, and remittances, are stationary at the 1st difference. The LLC and IPS tests are used for the selected variables at the level and 1st difference in this study and show the result of the panel unit root test in Table 4b. The test is used to ensure that either variable is stationary at the level or first difference. The result of the panel unit root test revealed that all variables are stationary at the level and first difference. The result of the LLC tests shows that the Gini coefficient, real effective exchange rate, real interest rate, general government final expenditure, and total tax revenue are stationary at the level, while broad money, GDP per capita, inflation, remittances, and financial development index are stationary at the 1st difference. The panel unit root test result of IPS in Table 4b reveals that the Gini coefficient, real interest rate, government expenditure, total tax revenue, and financial development index are stationary at the level, while broad money, GDP per capita, inflation, real effective exchange rate, and remittances are stationary at the 1st difference.

Table 4a: Unit root test results (individual countries)

	Azerbaijan			Kazakhstan		
Variables	At Level	1st Δ	Decision	At Level	1st Δ	Decision
Gini	0.0345	---	I(0)	0.0215	---	I(0)
M2	0.9500	0.0014	I(1)	0.5608	0.0016	I(1)
Y	0.1704	0.0320	I(1)	0.6816	0.0055	I(1)
P	0.9982	0.0449	I(1)	0.0001	--	I(0)
ER	0.2971	0.0244	I(1)	0.3053	0.0002	I(1)
RR	0.0028	---	I(0)	0.0032	---	I(0)
GE	0.4486	0.0276	I(1)	0.0198	---	I(0)
TTR	0.0113	--	I(0)	0.3852	0.0005	I(1)
RM	0.2970	0.0000	I(1)	0.0115	--	I(0)
FD	0.0289	--	I(0)	0.1055	0.0344	I(1)
	Kyrgyzstan			Tajikistan		
Gini	0.0408	---	I(0)	0.0191	--	I(0)
M2	0.0329	---	I(0)	0.1594	0.0007	I(1)
Y	0.5251	0.0059	I(1)	0.9999	0.0000	I(1)
P	0.0245	--	I(0)	0.0031	--	I(0)
ER	0.4313	0.0030	I(1)	0.0099	---	I(0)
RR	0.0476	----	I(0)	0.2626	0.0056	I(1)
GE	0.0057	---	I(0)	0.0799	0.0005	I(1)
TTR	0.0015	--	I(0)	0.5551	0.0055	I(1)
RM	0.8321	0.0006	I(1)	0.2842	0.0277	I(1)
FD	0.0253	--	I(0)	0.0058	--	I(0)

Source: Authors` computation

Table 4b: Panel unit root tests results

Tests	Variables	Level τ-test	Level ρ –value	1st Δ τ-test	1st Δ ρ –value
Levin, Lin & Chu t*(LLC)	$Gini_{it}$	-3.8291***	0.0001	-2.9784	0.0014
	$M2_{it}$	0.4191	0.6624	-4.2520***	0.0000
	Y_{it}	-0.0049	0.4980	-2.2649**	0.0118
	P_{it}	1.9016	0.9714	-3.0295***	0.0012
	ER_{it}	-2.6515***	0.0040	-2.4049	0.0081
	RR_{it}	-4.4006***	0.0000	-7.3463	0.0000
	GE_{it}	-1.8239**	0.0341	-2.7094	0.0034
	TTR_{it}	-2.6216***	0.0044	-3.4653	0.0003
	RM_{it}	-0.9249	0.1775	-1.5112*	0.0654
	FD_{it}	-1.5062	0.0660	-2.1421**	0.0161
Im, Pesaran and Shin (IPS)	$Gini_{it}$	-3.2517***	0.0006	-4.5266	0.0000
	$M2_{it}$	0.9987	0.8410	-4.3386***	0.0000
	Y_{it}	1.2228	0.8893	-2.3082**	0.0105
	Pit	5.0034	1.0000	-2.3305***	0.0099
	ER_{it}	-0.5967	0.2754	-4.4184***	0.0000
	RR_{it}	-2.7638***	0.0029	-7.5302	0.0000
	GE_{it}	-2.9525***	0.0016	-5.1863	0.0000
	TTR_{it}	-1.9551**	0.0253	-3.3448	0.0004
	RM_{it}	-0.7329	0.2318	-3.9015***	0.0000
	FD_{it}	-1.4263*	0.0769	-3.0077	0.0013

Source: Authors` computation

All variables are stationary at the level I(0) and 1st difference I(1). Based on these results, we used the Panel ARDL model to check the long-run and short-run impact of fiscal and monetary policies on income distribution.

The ARDL result

Table 5 shows the overall reports on the estimation results from equation 1, illustrating the impact of macroeconomic policies (i.e. fiscal & monetary) along with other regressors on income distribution. This study employed the Gini coefficient as a dependent variable in the equation with broad money, per capita income, inflation, real effective exchange rate, real interest rate, government expenditure, total tax revenue, remittances, and financial development index as the independent variables. The panel data approach was also conducted to examine the long-term and short-term influence of the independent variables on the dependent variable. The ARDL model chosen for this study is ARDL (3, 1, 1, 1, 1, 1, 1, 1, 1, 1) with the Akaike info criterion employed as a lag selection criterion. According to the results, the model has a log-likelihood of -41.5166 and a standard deviation of 1.679.

The empirical results of the ARDL model in the cases of individual countries, namely Azerbaijan, Kazakhstan, and Kyrgyzstan, reveal that the impacts of broad money on income inequality are negative and statistically significant in the long run. The estimated coefficients found for Azerbaijan, Kazakhstan, and Kyrgyzstan are -0.5336, -0.4941, and -0.3474, respectively. These results imply that monetary policy reduces income equality. These findings are consistent with the findings by Coibion et al. (2017). While the results are opposite in the case of a panel of four countries, which are in accord with the findings by Saiki & Frost (2014).

The impact of GDP per capita on income inequality has been found to be negative and significant in the long run. These results show that with an increase in GDP per capita, inequality is supposed to reduce in the selected Central Asian countries. Our findings are similar to the findings by Siami-Namini & Hudson (2019), Monnin (2014), and Hayrullahoglu & Tuzun (2020).

The impact of inflation on income inequality is found to be significantly positive in the long run. These results indicate that income inequality increases with an increase in inflation in the panel countries and individual countries, namely Azerbaijan and Kazakhstan. Our results are similar to the findings by Balcilar, Chang, Gupta & Miller (2018) and Law & Soon (2020). However, the effect of inflation in the case of Kyrgyzstan and Tajikistan on income distribution is negative. These findings are consistent with the findings by Siami-Namini & Hudson (2019) and Monnin (2014).

Nevertheless, the results of the study revealed that a real effective exchange rate has a significantly positive impact on income inequality in the long run. The estimated coefficient value indicates that when the real effective exchange rate increases by 1 percent in the long run, income inequality will also increase by 0.034% in panel countries and in the case of individual countries, namely Kazakhstan (0.0193%) and Tajikistan (0.0294%). This result is similar to the finding by Deyshappriya (2017). However, the impact of the real effective exchange rate in the case of Azerbaijan (-0.0314) and Kyrgyzstan (-0.3064%) is negative on income inequality. Our result is in accordance with the findings by Min, Shin & McDonald (2015).

Furthermore, the empirical results of the ARDL model in the cases of individual countries, namely Azerbaijan, Kazakhstan, and Kyrgyzstan, show that the effects of the real interest rate on income inequality are positive in the long run. The estimated coefficients for Azerbaijan, Kazakhstan, and Kyrgyzstan are 0.0086%, 0.1581%, and 0.10%, respectively. These results suggest that the real interest rate increases income inequality. These findings are consistent with the findings by Berisha et al. (2020) and Taghizadeh-Hesary et al. (2020). On the other hand, the results are opposite in the case of a panel of four countries (-0.12%) and also in Tajikistan (-0.0185%), indicating that the real interest rate reduces income inequality, which is consistent with the findings by Adeleye (2020) and Maraşlı (2016).

The empirical results show that the effect of government expenditure on income distribution in the long run is positive and significant in the panel of four countries. The coefficient of government expenditure in the long run reveals that an increase in government expenditure by 1% will increase income inequality by 0.314%. Our findings are similar to those of Khan & Padda (2021). However, individual results of the simple ARDL model for Azerbaijan reveal that government expenditure (0.936%) has an insignificantly positive impact on income inequality, while in Kyrgyzstan government expenditure (1.6579%) it has a significantly positive effect on income inequality. This result is in line with the findings of Khan & Padda (2021). The estimated coefficient effects of government expenditure on income inequality are negative in Kazakhstan (-0.5067%) and Tajikistan (-0.082%). This result is consistent with the findings of Alamanda (2020) who found that government expenditure decreases income inequality.

Furthermore, the study's results also show that in the long run, total tax revenue has a significantly positive impact on income inequality in the panel of four countries and an insignificantly positive effect on income inequality in individual countries, namely Azerbaijan and Tajikistan. The results indicate that an increase in total tax revenue by 1% increases income inequality by 0.72% in panel countries, 0.112% in Azerbaijan, and 0.0369% in Tajikistan. Similarly, for Kazakhstan, the estimated coefficient value (-0.0913%) suggests that the effect of total tax revenue on income inequality is negative and insignificant, while it is negative and significant (-0.8266) in Kyrgyzstan. These results are similar to the findings of Hayrullahoglu & Tuzun (2020) and Taghizadeh-Hesary et al. (2020).

However, the findings of the study demonstrated that the impact of remittances on income inequality, in the long run, is negatively significant in the panel of four countries (-0.12%) and in the case of individual countries, namely Azerbaijan and Tajikistan, -2.85 and -0.036%, respectively, and insignificantly negative effect on income inequality in Kazakhstan, and Kyrgyzstan, -4.59% and -0.19%, respectively. Our findings are consistent with Kóczán & Loyola (2021) and Bang et al. (2016) results. They observe that remittances decrease income inequality.

Nevertheless, the study also found that in the long run, the financial development index has a negative but significant influence on income inequality in panel countries (-2.07%) and Kazakhstan (-8.5027%) and insignificantly negative impact of financial development index on income inequality in Azerbaijan (-1.0867%), Kyrgyzstan (-2.168%), and Tajikistan (-0.1368%). These results are consistent with the findings by Azam & Raza (2018), Demirguc-Kunt & Levine (2010).

Table 5: The ARDL/PMG results

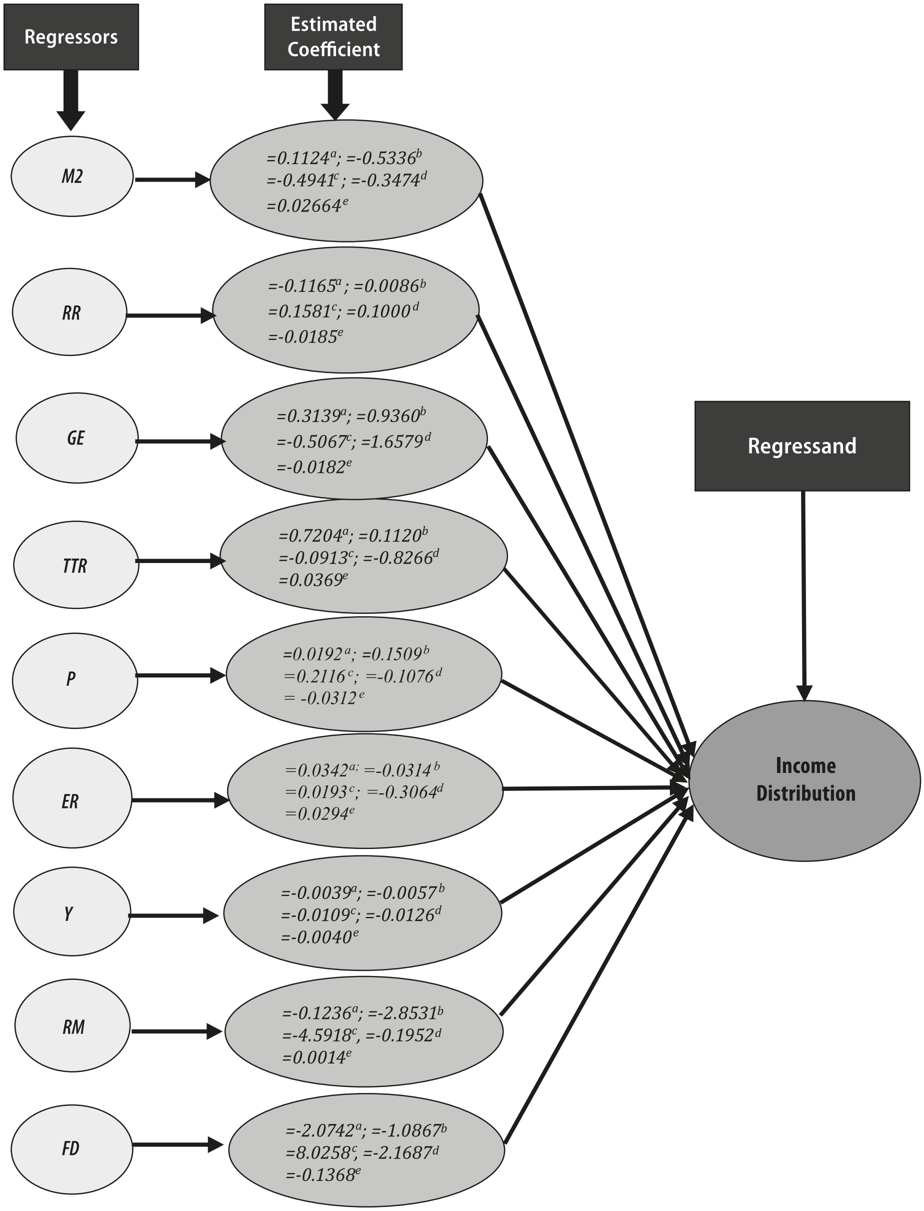
	Country(s)/ Variables	Panel-4	Azerbaijan	Kazakhstan	Kyrgyzstan	Tajikistan
		Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Long run estimates	M2 (broad money (% of GDP)	0.1124*** (0.0000)	-0.5336** (0.0374)	-0.4941** (0.0156)	-0.3474* (0.0534)	0.02664** (0.0384)
	Y (real GDP per capita)	-0.0039*** (0.0000)	-0.0057** (0.0178)	-0.0109** (0.0135)	-0.0126 (0.3638)	-0.0089** (0.0382)
	P (Inflation rate)	0.0192*** (0.0000)	0.1509 (0.3778)	0.2116* (0.0518)	-0.1076* (0.0847)	-0.0312** (0.0148)
	ER (real effective exchange rate)	0.0342*** (0.0000)	-0.0314 (0.7399)	0.0193 (0.6970)	-0.3064*** (0.0051)	0.0294** (0.0124)
	RR (real Interest rate (%))	-0.1165*** (0.0006)	0.0086 (0.8987)	0.1581** (0.0267)	0.1000 (0.1646)	-0.0185* (0.0646)
	GE (general govt final spending (% of GDP))	0.3139*** (0.0000)	0.9360 (0.1110)	-0.5067* (0.0442)	1.6579** (0.0186)	-0.0818 (0.0146)
	TTR (total tax revenue (% of GDP)	0.7204*** (0.000)	0.1120 (0.8565)	-0.0913 (0.2562)	-0.8266* (0.0945)	0.0369 (0.4248)
	RM (foreign remittances inflows)	-0.1236*** (0.0000)	-2.8531** (0.0111)	-4.5918 (0.1647)	-0.1952 (0.1833)	-0.0357** (0.0110)
	FD (financial development index)	-2.0742*** (0.0000)	-1.0867 (0.8206)	-8.5027*** (0.0065)	-2.1687 (0.3907)	-0.1368 (0.6013)

	ECM	-0.3752** (0.0143)	-1.8567*** (0.0001)	-3.3699*** (0.0002)	-0.1521*** (0.0000)	-0.1648*** (0.0000)
	Δ(GINI (-1))	-0.4238 (0.1127)	0.8135*** (0.0007)	1.9689*** (0.0003)	-0.7008*** (0.0000)	-0.3381*** (0.0054)
	Δ (GINI (-2))	0.4238 (0.5834)	0.7062*** (0.0011)	0.6179*** (0.0008)		
	Δ (M2)	-0.0500 (0.7093)		-0.4941*** (0.0002)	-0.3474*** (0.0002)	0.0312*** (0.0001)
	Δ (Y)	0.0081 (0.1247)		-0.0109*** (0.0002)		-0.0040*** (0.0015)
Short run estimates	Δ (P)	-0.1162* (0.0928)	-0.1509*** (0.0026)	0.2116*** (0.0008)	-0.10756*** (0.0008)	-0.0312*** (0.0000)
	Δ (ER)	-0.0440* (0.0917)	-0.03138 (0.1252)	0.0193*** (0.0205)	-0.3064*** (0.000)	0.0294*** (0.0000)
	Δ(RR)	0.0494 (0.3714)	0.0086 (0.4353)	0.1581*** (0.0007)	0.10007*** (0.0016)	
	Δ (GE)	0.0745 (0.5152)	0.9360*** (0.0008)	-0.5067*** (0.0015)		0.0182** (0.0296)
	Δ (TTR)	-0.3082 (0.3062)			-0.8266*** (0.0001)	0.0369* (0.0789)
	Δ (RM)	-0.4311 (0.1594)		-4.5918*** (0.0015)	-0.1952*** (0.0019)	0.0014 (0.6317)
	Δ (FD)	2.4272*** (0.0018)	-1.0867* (0.0654)	8.0259*** (0.0002	-2.1697** (0.0187)	-0.1368 (0.1607)
	Constant	7.2055*** (0.0054)	59.1735** (0.0265)	112.6961*** (0.0000)	-1.9014*** (0.0000)	5.4882*** (0.0000)
		(3, 1, 1, 1, 1, 1, 1, 1, 1, 1)	(3, 0, 0, 1, 1, 1, 1, 0, 0, 1)	(3, 1, 1, 1, 1, 1, 1, 0, 1, 1)	(2, 1, 0, 1, 1, 1, 0, 1, 1, 1)	(1, 0, 1, 1, 0, 1, 1, 1, 1)

Note: Regressand is Gini index. Model selection method: Akaike info criterion (AIC). Asterisks (***), (**), and (*) show statistically significant at 1%, 5%, and 10%, respectively. ECM = Error Correction Term.

The error correction coefficient, which indicates the model's speed of adjustment toward the long-run equilibrium, is revealed by the short-run equation. The ECM is estimated as (-0.3752%), which is statistically significantly negative at the 5% level. These results demonstrate that the model`s annual adjustment to the long-run equilibrium is nearly 37%. These findings reveal that the speed of adjustment is fast, at 37% per year, and will take nearly 2.8 years to reach long-run equilibrium (Azam, 2020). Consequently, the ECM's statistically significantly negative results strongly support theoretical predictions. Furthermore, the negatively significant error correction term indicates a trend of the long-run equilibrium (see Table 5). Overall results in a summarized form on the panel and individual countries are shown in Figure 2.

Figure 2: Impact of fiscal and monetary policy on income distribution



Source: Authors` own construction

Note: Asterisks a, b, c, d, and e represents Panel countries, Azerbaijan, Kazakhstan, Kyrgyzstan, and Tajikistan respectively.

5. Concluding remarks

This study aims to add to the existing literature by examining the relationship between fiscal and monetary policies, along with other regressors (GDP per capita, real effective exchange rate, foreign remittances inflow, and financial development index), and income distribution in four Central Asian countries (Azerbaijan, Kazakhstan, Kyrgyzstan, and Tajikistan) from 1995 to 2020. The study employed a panel unit root test and a panel ARDL model. The results of the study show that government expenditure and total tax revenue in fiscal policy increase income inequality in the long run. The Panel ARDL approach reveals that government expenditure has a positive and significant impact on income inequality in the long run, but only an insignificant positive impact in the short run. The result also reveals that the influence of total tax revenue on income inequality is positive and significant. Also, in the short run, the effect of total tax revenue on income inequality is negative and insignificant. Results explore that monetary policy by broad money increases income inequality, while monetary policy by the real interest rate decreases income inequality in the long run. The finding of the study shows that broad money has a significantly positive impact on income inequality in the long run, while its effect on income inequality in the short run is insignificant and negative. The result also demonstrates that the real interest rate has significantly negative and insignificantly positive effects on income inequality in the short run. Furthermore, the findings of the ARDL approach indicate that broad money significantly reduces income inequality in Azerbaijan, Kazakhstan, Kyrgyzstan, and Tajikistan. The study also demonstrates that per capita GDP decreases income inequality in the long run but increases it in the short run. Moreover, the result of the simple ARDL method reveals that GDP per capita reduces income inequality in Azerbaijan, Kazakhstan, Kyrgyzstan, and Tajikistan.

Furthermore, the result indicate that inflation enhances income inequality in the long run and mitigates income inequality in the short run. In the long run, inflation has a positive and significant impact on income inequality whereas the negative but significant impact on income inequality in the short run. Nevertheless, the result of the ARDL approach suggests that inflation insignificantly increases income inequality in Azerbaijan, and significantly increases it in Kazakhstan, whereas inflation significantly reduces income inequality in Kyrgyzstan, Tajikistan.

The panel ARDL estimates show that the real effective exchange rate has a significantly positive impact on income inequality in the long run, but a negative impact in the short run. The study indicates that a real effective exchange rate increases income inequality in the long run yet decreases it in the short run. In addition, the result of the simple ARDL technique demonstrates that the real effective exchange rate insignificantly diminishes income inequality in Azerbaijan; while significantly decreasing income inequality in Kyrgyzstan and also the real effective exchange rate insignificantly increases income inequality in Kazakhstan but significantly enhances it in Tajikistan.

Results also indicate that the real interest rate insignificantly increases income inequality in Azerbaijan and Kyrgyzstan and significantly increases in Kazakhstan, while it significantly decreases income inequality in Tajikistan. However, the simple ARDL model shows that government expenditure insignificantly widens income inequality in Azerbaijan and significantly increases in Kyrgyzstan, whereas significantly reduces income inequality in Kazakhstan and Tajikistan. Results also reveal that total tax revenue insignificantly enhances income inequality in Azerbaijan and Tajikistan, whereas insignificantly mitigates income inequality in Kazakhstan and significantly decreases income inequality in Kyrgyzstan. The panel ARDL estimates suggest that the impact of remittances on income distribution is significantly negative in the long run, while in the short run, the effect is insignificantly negative. Results also suggest that remittances have a significantly negative effect on income inequality in Azerbaijan and Tajikistan, whereas an insignificantly negative impact on income inequality in Kazakhstan and Kyrgyzstan. Additionally, the results reveal that financial development has a significantly negative effect on income distribution in the long run and an insignificantly positive effect on income distribution in the short run. The results of the ARDL model indicate that financial development has a negative and insignificant effect on income inequality in Azerbaijan, Kyrgyzstan, and Tajikistan, while in Kazakhstan, the impact of the financial development index on income inequality is negative but significant.

Based on the findings, this study suggests many policy implications. Namely, government expenditure and overall tax revenue in fiscal policy are likely to exacerbate income inequality over time. To combat this, authorities should direct government expenditure towards social welfare programs and infrastructure development that assist low-income populations. In addition, the design of progressive tax systems can result in a more equitable distribution of tax burdens, thereby reducing economic disparities. In terms of monetary policy, the study reveals that broad money increases income inequality over time, whereas the real interest rate decreases it. Policymakers must carefully regulate the money supply and credit creation to limit the adverse effects of a large money supply on income distribution, while also considering interest rate policies that strike a balance between promoting economic growth and reducing income disparities.

The research also highlights the significance of the actual effective exchange rate in determining income disparity. To avoid aggravating long-term income inequality, policymakers must carefully regulate exchange rate fluctuations. In the long run, per capita GDP has been shown to reduce income disparity, but in the short run, it increases it. To encourage long-term reductions in income disparity, policymakers should prioritize inclusive economic growth that benefits all segments of society. Inflation also affects income disparity over time, either by increasing it or decreasing it. To establish a more equitable distribution of income, policymakers should implement measures to prevent inflation and maintain economic stability. To effectively reduce income inequality, policymakers should also support measures that increase remittance flows and ensure that the benefits are distributed equitably. Lastly, financial development has a long-term effect on income distribution, highlighting the significance of prioritizing financial sector reforms that increase access to financial services for all strata of the population, thereby contributing to a more equitable income distribution.

In conclusion, the paper's policy recommendations advocate for a coordinated strategy that includes prudent fiscal policies, targeted monetary interventions, and financial sector reforms. These policies aim to eliminate income disparities and foster long-term economic growth in Central Asia, while also nurturing inclusive growth and improved living conditions for all residents.

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