Transactions on Quantitative Finance and Beyond

www.tqfb.reapress.com

Trans. Quant. Fin. Bey. Vol. 3, No. 1 (2026) 1–15.

Paper Type: Original Article

Examining the Impact of Economic Growth on Income Distribution in the Iranian Economy: Application of Generalized Method of Moments (GMM)

Seyyed Fakhreddin Fakhrhosseini*

Department of Accounting, Management and Accounting faculty, Tonekabon Branch, Islamic Azad University, Tonekabon, Iran; f_fkm21@yahoo.com.

Citation:

Received: 10 June 2025 *Revised: 18 July 2025* *Accepted: 03 November 2025*	Fakhrhosseini, S. F. (2026). Examining the impact of economic growth on income distribution in the Iranian economy: application of generalized method of moments (GMM). *Transactions on quantitative finance and beyond, 3*(1), 1-15.

Abstract

Multiple factors can influence income distribution, making it crucial to identify these factors and examine their effects. This study aims to analyze the impact of economic growth on income distribution in Iran by utilizing the Generalized Method of Moments (GMM) approach with data from 31 provinces of the country between the years 2006 and 2022. The results indicate that per capita government current expenditures and per capita subsidies have a negative and significant effect on the Gini coefficient. Additionally, the findings reveal that per capita Gross Domestic Product (GDP) positively affects the Gini coefficient. Furthermore, the unemployment rate demonstrates that higher unemployment is associated with greater income inequality. According to the results of this study, per capita bank facilities and the inflation rate have a positive impact on the Gini coefficient. The findings also show that direct taxes have a positive effect on the Gini coefficient, while the effect of indirect taxes per capita on the Gini coefficient is significantly negative. Additionally, the impact of wealth tax on the Gini coefficient is found to be significantly positive. Conversely, the taxes imposed on corporate income and on goods and services have a significantly negative effect on the Gini coefficient.

Keywords: Economic growth, Income distribution, Generalized method of moments.

1 | Introduction

In economic literature, there have been numerous studies on the relationship between income inequality and economic growth. The increase in income inequality in most countries, along with empirical studies that present contradictory results regarding the relationship between inequality at the per capita income level and

Corresponding Author: f_fkm21@yahoo.com

https://doi.org/10.22105/tqfb.vi.58

economic growth, highlights the significance of this issue (e.g., Partridge [1], Li et al. [2] and Forbes [3], which suggest positive relationships, while Alesina and Rodrik [4]. Found negative relationships between these two variables). These results have sparked considerable debate because they may pose significant challenges for policymakers. From a policy perspective, several theoretical models demonstrate a positive relationship between income inequality and economic growth, such as those proposed by Li et al. [2] and Galor and Tsiddon [5], while other theoretical models indicate a negative relationship, as seen in the works of Alesina and Rodrik [4] and Persson and Tabellini [6]. However, it is not feasible to formulate well-informed public policy based solely on these correlations, as simplistic correlations may lead to misleading economic policies.

Several empirical studies, such as Partridge [1], Fallah and Partridge [7], and Panizza [8], utilize country panel data to examine the relationship between economic growth and income inequality. Furthermore, the relationship between inequality and per capita level or growth varies depending on the time intervals examined. Generally, studies analyzing short-term relationships, such as those by Li et al. [2], have found positive correlations, while long-term studies, including Forbes [3], have yielded negative correlations. Additionally, Persson and Tabellini [6] and Alesina and Rodrik [4], which employed data from longer periods, also concluded negative relationships. It is noteworthy that this adjustment (averaged over n periods) is not without criticism. Attanasio et al. [9] argue that the length of business cycles can vary over time, potentially leading to different results.

Therefore, considering the aforementioned issues, the objective of this study is to provide a clear analysis of the impact of economic growth on income distribution and to examine this within the framework of an econometric model for Iran. Recent theoretical discussions and subsequent empirical investigations suggest that fluctuations in economic growth have had an observable impact. In other words, it is essential to determine how the increases and decreases in economic growth, in light of the conditions of the Iranian economy, affect income distribution in terms of intensity and direction. In this regard, this research utilizes data from provinces over the period from 2006 to 2022 and employs the GMM approach to investigate this topic.

2 | Theoretical Foundations and Literature Review

2.1 | Theoretical Foundations

The relationship between economic growth and income distribution is a complex and multifaceted issue that has been examined through various theoretical frameworks. Here, some key theoretical foundations are presented.

Inverse U-curve hypothesis: proposed by Kuznets [10], this hypothesis suggests that as an economy develops, income inequality initially increases, reaches a peak, and then declines with continued economic growth. This pattern reflects the transition from a predominantly agricultural society to a more industrialized one, where wealth becomes concentrated before broader economic benefits are realized. Kuznets based his theory on empirical observations from both wealthy and poor countries over time [11].

Classical approach: this perspective assumes that income inequality can stimulate economic growth by encouraging savings and investment among wealthy individuals. Higher savings rates among the affluent can lead to increased capital accumulation, which is essential for growth. Kaldor [12] argued that an unequal income distribution might result in higher growth rates due to these saving tendencies [13].

Modern approach: in contrast, modern theories suggest that high levels of income inequality can hinder economic growth. Empirical studies have demonstrated that inequality can negatively impact growth through mechanisms such as reduced access to education and healthcare services for low-income groups, leading to diminished overall productivity [14].

Credit market failures: access to financial resources plays a crucial role in the relationship between income distribution and economic growth. Inequality can limit low-income individuals' access to credit, undermining their ability to invest in education or entrepreneurship—factors vital for economic mobility [15], [16].

Political Economy: The political ramifications of income inequality also affect economic growth. High inequality may lead to social unrest or political instability, which can deter investment and slow economic progress. Conversely, it may prompt redistributive policies aimed at stabilizing society, potentially enhancing long-term growth prospects by improving human capital [6], [8], [17].

3 | Literature Review

Various international studies have addressed the relationship between economic growth and income inequality, yielding diverse results, some of which are summarized below:

Vieira et al. [18] demonstrate in their study that the relationship between income distribution, economic growth, and the financial system in the Brazilian economy indicates that the financial sector has contributed to economic growth and income generation. However, it has also created negative effects on income distribution due to unequal access to financial tools among different income classes. Azevedo et al. [19] argue that Brazil's economic growth regime has been wage-led, meaning that capital accumulation and aggregate demand have been supported by policies aimed at reducing inequality in the labor market and personal income. Mdingi and Ho [14] conduct a comprehensive review of various theoretical models linking income inequality to economic growth, identifying multiple transmission mechanisms such as technology, political stability, and credit market failures. Their findings suggest that the relationship can be negative, positive, or uncertain, highlighting the need for further empirical research to clarify these relationships in different economies. Dollar and Kraay [20] investigate how globalization has altered income distribution patterns worldwide, considering both the positive and negative effects on economic growth depending on local contexts and governmental policies adopted to effectively manage globalization challenges.

Amitrano and Vasconcelos [21] aim to provide an analytical contribution to post-Keynesian literature regarding the relationship between income distribution, inflation, and economic growth in an open economy. Bruckner and Lederman [22] examine how the relationship between income inequality and Gross Domestic Product (GDP) growth varies based on initial income levels of countries. Their report highlights that in low-income countries, higher income inequality may strengthen transitional growth, while in high-income countries, it has a negative impact on growth. This study emphasizes the long-term effects of inequality on economic performance, predicting that a 1% increase in the Gini coefficient could reduce GDP growth by over 1% in an average country. Piketty et al. [23] assess how tax policies influence income distribution dynamics and overall economic performance, arguing that progressive taxation can reduce inequality while promoting sustainable growth strategies in various economies. These findings support reforms aimed at increasing equity through taxation systems. Zaman and Shamsuddin [24] used a panel from 18 countries in the Latin American and Caribbean region to assess the relationship between growth, inequality, and poverty, confirming the effectiveness of per capita income and income inequality on poverty.

In Iran, various studies have examined the relationship between economic growth and income inequality, as well as the relationship between economic growth and poverty, yielding diverse results, some of which are highlighted below:

Nobahar et al. [25] investigated the relationship between income inequality, urbanization, and economic growth in the provinces of Iran during the period from 2006 to 2019. The results obtained from modeling using a spatial panel approach indicate that the variables of urbanization rate, per capita GDP, and literacy are among the most influential factors on income inequality in the provinces. Rahimi and Esfandiari [26] examined the impact of relative redistribution on economic growth, finding an indirect relationship between economic growth and inequality confirmed through their study using the relative redistribution index. Sheikhi Tash and Alizadeh [27] show that a positive relationship exists between economic growth and poverty. Their

computational results, based on fuzzy logic, indicate that the optimal conditions arise when economic growth averages 8% and the Gini coefficient is approximately 38.5%. Maboudi and Darhnazari [28] demonstrate that, in addition to financialization, variables such as government consumption spending, economic growth, inflation, and economic sanctions have positive and significant impacts, while targeted subsidy policies have a negative and significant effect on income inequality.

A review of conducted studies reveals that the relationship between economic growth and income distribution has been a focal point in economic research. Traditional models often assume a linear relationship, but recent methods such as the Generalized Method of Moments (GMM) offer new insights into this complex interaction. Vo et al. [29] detected a bidirectional relationship between income inequality and economic growth using the Dumitrescu and Hurlin Granger non-causality test. Furthermore, through GMM estimations, there is evidence of the negative impact of inequality on economic growth. Significant research gaps remain, particularly regarding how these models can elucidate the asymmetric effects of economic growth on income distribution. Therefore, utilizing GMM methods represents a promising avenue for advancing our understanding of the relationship between economic growth and income distribution. By addressing existing research gaps, scholars can significantly contribute to economic discussions aimed at fostering equitable economic development.

4 | Research Methodology

4.1 | Data and Variables

In this study, provincial data for the Iranian economy spanning the years 2006 to 2022 is utilized. The information used in this research is sourced from publications by the Statistical Center of Iran, the Central Bank of the Islamic Republic of Iran, and other Iranian databases.

4.2 | Research Model

In this research, three models for the entire country using provincial data will be introduced to examine the factors influencing income distribution as follows:

$$\mathrm{Gini}_{i,t} = f(\mathrm{gini}_{i,t-1}, \mathrm{GE}_{i,t}, \mathrm{UN}_{i,t}, \mathrm{Ggdp}_{i,t}, \mathrm{FAC}_{i,t}). \quad \text{Without Subsidy}$$

$$\mathrm{Gini}_{i,t} = f(\mathrm{gini}_{i,t-1}, \mathrm{GE}_{i,t}, \mathrm{UN}_{i,t}, \mathrm{Ggdp}_{i,t}, \mathrm{FAC}_{i,t}, \mathrm{TR}_{i,t}). \quad \text{With Subsidy} \tag{1}$$

$$\mathrm{Gini}_{i,t} = f(\mathrm{gini}_{i,t-1}, \mathrm{TAXI}_{i,t}, \mathrm{TAXID}_{i,t}, \mathrm{UN}_{i,t}, \mathrm{Ggdp}_{i,t}, \mathrm{INF}_{i,t}). \quad \text{Without Subsidy}$$

$$\mathrm{Gini}_{i,t} = f(\mathrm{gini}_{i,t-1}, \mathrm{TAXI}_{i,t}, \mathrm{TAXID}_{i,t}, \mathrm{UN}_{i,t}, \mathrm{Ggdp}_{i,t}, \mathrm{INF}_{i,t}, \mathrm{TR}_{i,t}). \quad \text{With Subsid} \tag{2}$$

$$\mathrm{Gini}_{i,t} = f(\mathrm{gini}_{i,t-1}, \mathrm{LCT}_{i,t}, \mathrm{LPT}_{i,t}, \mathrm{LWT}_{i,t}, \mathrm{LVAT}_{i,t}, \mathrm{UN}_{i,t}, \mathrm{Ggdp}_{i,t}, \mathrm{INF}_{i,t}). \quad \text{Without Subsidy}$$

$$\mathrm{Gini}_{i,t} = f(\mathrm{gini}_{i,t-1}, \mathrm{LCT}_{i,t}, \mathrm{LPT}_{i,t}, \mathrm{LWT}_{i,t}, \mathrm{LVA}_{i,t}, \mathrm{UN}_{i,t}, \mathrm{Ggdp}_{i,t}, \mathrm{INF}_{i,t}, \mathrm{TR}_{i,t}). \quad \text{With Subsidy} \tag{3}$$

In which $\mathrm{Gini}_{i,t}$ represents the Gini coefficient, $\mathrm{TAXI}_{i,t}$ denotes per capita direct taxes; TAXID indicates per capita indirect taxes; $\mathrm{UN}_{i,t}$is the unemployment rate; $\mathrm{Ggdp}_{i,t}$ signifies the per capita GDP growth rate; INF represents the inflation rate; and $\mathrm{TR}_{i,t}$ refers to per capita subsidies, with ii indicating the province and t denoting the year.

4.3 | Statistical Method

The variables of the model in this study are estimated using the GMM. Typically, panel data are estimated based on dynamic models. One of the characteristics of panel data is that by incorporating the time factor, the dynamics among variables can be interpreted. The GMM is one of the parameter estimation methods in the approach to dynamic panel data, which is applicable to time series, cross-sectional, and panel data. This method takes into account the dynamic adjustment effects of the dependent variable. When in the panel

model, the dependent variable appears as a lagged term on the right side, Ordinary Least Squares (OLS) estimators are no longer consistent, and it is necessary to resort to two-stage estimation methods or generalized moments [30]. According to Mátyás and Sevestre [31], estimation may yield large variances for coefficients due to instrument selection problems, making the estimates statistically insignificant. Therefore, the GMM method proposed by Arellano and Bond addresses this issue. This estimator enhances the stability of estimates by reducing sample bias [30].

5 | Research Findings

5.1 | Descriptive Statistics of the Data

In descriptive methods, the goal is to describe the research data by providing tables and utilizing descriptive statistical tools such as measures of central tendency and dispersion, which contributes to the clarity of the topic. The descriptive statistics for the research variables for 429 year-province observations are presented in *Table 1*.

Based on the descriptive statistics, the indicators can be divided into central tendency indicators and dispersion indicators, along with other indices. The central tendency indicators include the mean and median, while the dispersion indicators consist of the standard deviation. Other indices include minimum, maximum, skewness, and kurtosis. In summary, the average Gini coefficient across provinces indicates that the Gini coefficient is approximately 0.33 on average.

Table 1. Descriptive statistics.

Variable	Mean	Med	Max	Min	Std. Dev.	Skew	Kurt	Obs
LTAXI	-0.0002	-0.07	2.252	-1.06	0.572	0.848	-0.0002	429
LTAXID	-0.363	-0.395	1.87	-2.002	0.761	0.236	-0.363	429
GINI	0.33	0.32	0.47	0.23	0.04	0.41	3.62	429
LGE	4.33	4.27	6.76	1.79	0.88	0.1	2.75	429
LUN	2.4	2.42	3.09	1.75	0.25	-0.03	2.79	429
LGDP	8.79	8.68	10.43	7.9	0.55	0.88	3.18	429
LFAC	0.75	0.68	2.99	-0.48	0.48	1.82	9.89	429
LTR	1.97	1.87	5.71	-0.08	0.86	0.45	3.42	429
LCT	7.29	6.96	12.84	4.64	1.56	0.9	3.81	429
LPT	7.24	7.15	11.99	4.67	1.23	0.74	4.04	429
LWT	5.24	5.11	12.19	2.12	1.47	0.82	4.83	429
LVAT	7.31	7.25	12.63	3.33	1.72	0.28	2.79	429
LINF	2.91	3.01	3.86	1.54	0.57	-0.39	1.9	429

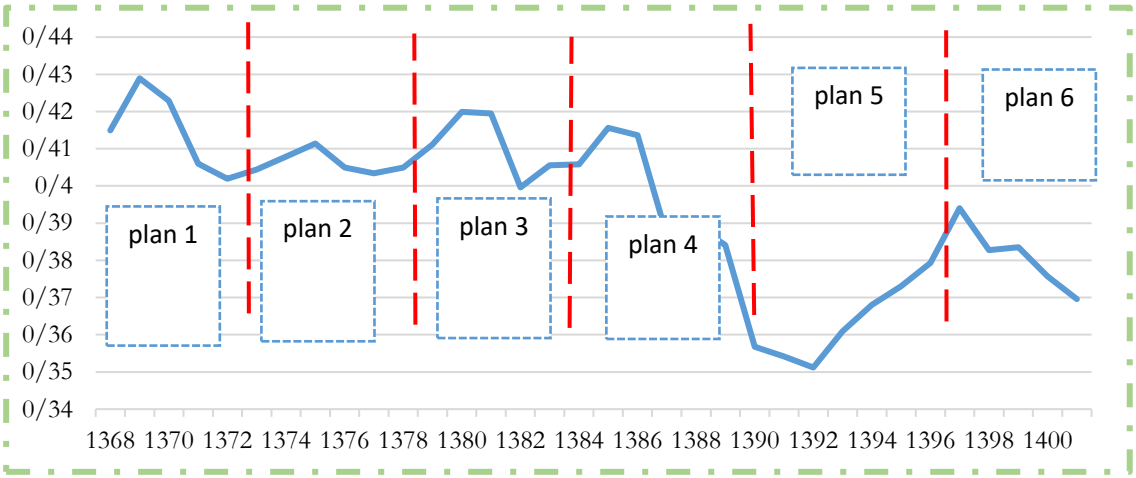
Source: research findings

5.2 | Analysis of Trends in Select Research Variables

5.2.1 | Gini coefficient

As illustrated in *Fig. 1*, the Gini coefficient reached 0.3568 at the end of the Fourth Five-Year Development Plan, marking its lowest value during the implementation of this plan and the three preceding development plans. This decreasing trend continued until 2013, reaching a value of 0.3512. However, following the imposition of stringent sanctions on the Iranian economy, the index increased to 0.3970 by 2018, at the commencement of the Sixth Development Plan. Focusing on the Fifth Development Plan, the Iranian economy experienced notable changes in per capita income and the Gini coefficient. The Gini coefficient, an indicator of income distribution within society, decreased from 0.3568 in 2011 to 0.3512 in 2013, before rising again to 0.3793 by the end of the Fifth Development Plan. Simply stated, the average income of Iranians

decreased by over 30% during this period, while income distribution became more unequal. This implies that in addition to a general decline in the real income of all members of society, lower-income deciles experienced a more severe reduction in income. Regarding the Sixth Development Plan, the index began to decline after 2018, decreasing to 0.3694 in 2022. Analysis of this income distribution index indicates a significant improvement in the class divide during the implementation of the Sixth Development Plan. Due to the implementation of the policy to reform preferential currency exchange rates and the popularization of subsidies, we are hopeful to see the continuation of the improvement of this index.



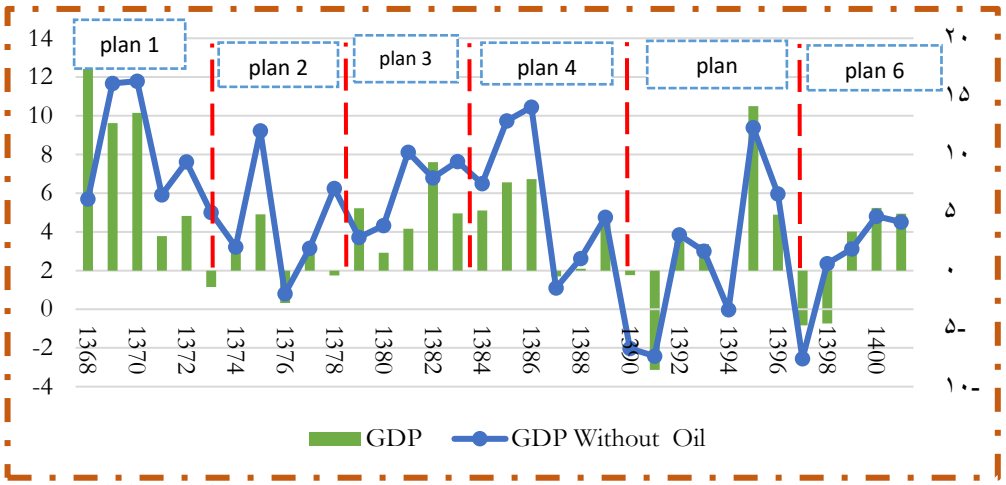
Source: research findings

Fig. 1. Gini coefficient index during the first to sixth development plans.

5.2.2 | Economic growth

Fig. 2 indicates that the Iranian economy experienced negative growth in 8 years of this 34-year period. This suggests that the impact of positive growth rates in various periods is offset, preventing the achievement of sustained and continuous growth.

A more detailed analysis of the negative growth rates reveals that the country experienced economic recession during the revolution and the 8-year war, as well as during periods of heightened sanctions. The 2010s were one of the most volatile decades in terms of economic growth fluctuations. During the Fifth Development Plan, in 2012, Iran's economic growth experienced a significant decline due to a shock in reduced oil revenues, causing the Iranian economy to shrink by about 8%. Subsequently, in 2013 and 2014, economic growth became positive (albeit with small figures), but in 2015, with the decrease in oil prices and revenues, economic growth turned negative again. Therefore, the effects of the oil shock of 2012 remained persistent. In 2016, when economic growth increased to about 12%, the GDP gap from 2011 to 2015 was filled. Throughout the years of implementation of the Sixth Development Plan, from 2018, when the second shock of reduced oil revenues hit the country's economy, economic growth turned negative again, and in 2019, an even greater negative growth occurred. In this situation, in 2020, economic growth with oil approached one, so that the economy could get out of the negative situation, and this growth reached 5.4 and 4.9 percent in 2021 and 2022."



Source: statistical center of Iran

Fig. 2. GDP growth rate at basic prices (percentage-constant prices of 2004).

5.3 | Unit Root (Stationarity) Test

With the expansion of unit root tests for panel data, the research by Phillips and Sul [32] demonstrated that these tests can be associated with estimation errors when there is correlation among cross-sectional units. In other words, the null hypothesis of no correlation among the sections is often rejected in many studies. Accordingly, Pesaran [33] considered a form of unit root test that accounts for correlation among cross-sectional data. This test, known as the CADF test, takes into account all factors causing heterogeneity. In fact, Pesaran utilized a generalized Dickey-Fuller regression type that includes the average lag of the variables in each section and the average difference of the variables in each section [34].

Based on the results of the CADF stationarity test presented in *Table 3*, it shows that variables such as per capita bank loans and unemployment rate are not stationary at level; however, other variables become stationary after first differencing at a significance level of 5%. All variables are categorized as I(0) and I(1).

In panel data analysis, it is assumed that the data used are cross-sectionally independent. However, dependencies among sections may arise from factors such as external effects, regional and economic connections, interdependencies of unobserved residual components, and unobserved anomalies across different sections [35]. For this reason, multiple tests, such as the Pesaran et al. [36] CD test, have been proposed, and the results are reported in *Table 2*. According to the Pesaran CD test, all variables exhibit cross-sectional dependence, meaning that the null hypothesis of no cross-sectional dependence is rejected. In other words, the existence of cross-sectional dependence is confirmed; hence, due to this cross-sectional dependence, the results from second-generation tests, or the CADF test, should be utilized for the stationarity analysis of these variables.

Table 2. Unit root test.

Variable	CADF (Level)	CADF (First Difference)	CD (Cross-Sectional Dependence)
Gini	-1.85 (0.03)	-8.37 (0.00)	16.6 (0.00)
Ggdp	-6.15 (0.00)	-9.59 (0.00)	5.36 (0.00)
Inf	-16.6 (0.00)	-13.68 (0.00)	8.83 (0.00)
Fac	1.22 (0.88)	-4.81 (0.00)	2.46 (0.00)
Ge	-8.56 (0.00)	-9.05 (0.00)	3.80 (0.00)
UE	2.34 (0.99)	-4.51 (0.00)	5.58 (0.00)

Source: research findings

Table 3. Unit root test results.

Variable	Levin et al.	Im et al.	Fisher-Price	Stationarity Level
Gini	-6.48 (0.00)	-6.41 (0.00)	15.31 (0.00)	I(0)
Ggdp	-9.37 (0.00)	-6.33 (0.00)	14.71 (0.00)	I(0)
Inf	-11.75 (0.00)	-7.22 (0.00)	15.58 (0.00)	I(1)
Fac	-5.36 (0.00)	-4.07 (0.00)	10.64 (0.00)	I(0)
Ge	-17.7 (0.00)	-13.3 (0.00)	27.79 (0.00)	I(0)
UE	-5.67 (0.00)	-6.52 (0.00)	15.01 (0.00)	I(1)

Source: research findings

There are various tests available for determining the stationarity of panel data. To examine stationarity, three types of unit root tests were conducted: Levin et al. [37] test, Im et al. [38] test, and Phillips and Perron [39] test. The results of these tests, presented in *Table 3*, indicate that the variables of the Gini coefficient, per capita GDP growth, per capita bank loans, and government expenditures are stationary at level and of type I(0), while the variables of inflation rate and unemployment rate are of type I(1) and become I(0) after first differencing.

5.4 | Exogeneity Test of the Dependent Variable with Lags

To examine the validity of the hypothesis of exogeneity of the lagged dependent variable, the Arellano-Bond test was used to check for the absence of autocorrelation over two different time periods for each of the models. In other words, this means that the lagged dependent variable in the model does not correlate with the error term and acts as an independent variable. The output of the test, shown in *Table 4*, indicates the absence of autocorrelation. As shown in the results of the table, the AR(1) test is statistically significant for all four models of the study, while the AR(2) test is not statistically significant. Therefore, these results indicate that the exogeneity test of the lagged dependent variable is confirmed, and the lagged dependent variable in the model does not correlate with the error term.

Table 4. Test indicating the absence of autocorrelation.

Model	Test	m-Statistic	rho	SE(rho)	Prob.
Model 1	AR(1)	-4.06	-0.18	0.05	0
	AR(2)	-0.78	-0.02	0.03	0.44
Model 2	AR(1)	-3.49	-0.17	0.05	0
	AR(2)	-1.62	-0.04	0.03	0.11
Model 3	AR(1)	-6.44	-0.18	0.03	0
	AR(2)	-1.78	-0.04	0.02	0.08

Source: research findings

5.5 | Model Estimation Results

Based on the existing literature, the impact of variables such as per capita government expenditure, unemployment rate, per capita GDP, per capita banking facilities, and the logarithm of per capita subsidies on the Gini coefficient was estimated using the GMM. The results are presented in *Table 5*.

5.5.1 | Model 1: with and without subsidies

A critical indicator in the GMM estimation is the Sargan test for over-identifying restrictions. The test statistic exceeds 0.05, suggesting that the instrumental variables selected for the model are valid. As shown in *Table 5*, the results indicate that all independent variables have a statistically significant effect on the Gini coefficient. Per capita government expenditure has a negative and significant impact on the Gini coefficient. Specifically, a one percent increase in per capita government expenditure is associated with a 0.003 decrease in the Gini coefficient, indicating a reduction in income inequality. Conversely, per capita GDP, the unemployment rate,

and per capita banking facilities exhibit positive and significant effects on the Gini coefficient, implying that an increase in these variables leads to increased income inequality.

Table 5. GMM estimation for model 1.

Variable	Without Subsidy		With Subsidy	
	Coefficient	Prob.	Coefficient	Prob.
L.Gini (-1)	0.133	0	0.087	0
LGe	-0.003	0	-0.003	0
LUE	0.006	0.023	0.012	0.003
LGDP	0.013	0	0.013	0
LFac	0.071	0	0.073	0
LSub	-	-	-0.034	0.004
Inst. Rank	32		31	
J-statistic	28.8 (0.37)		28.9 (0.26)	

Source: research findings

5.5.2 | Model 2: with and without subsidies

Further analysis of the determinants of income distribution was conducted in *Model (2)*, which was fitted with and without the inclusion of the subsidy variable. The results are presented in *Table 6*. A critical indicator in the GMM estimation is the Sargan test for over-identifying restrictions. The test statistic exceeds 0.05, suggesting that the instrumental variables selected for the model are valid. Based on *Table 6*, direct taxes positively impact the Gini coefficient: a one percent increase in per capita direct taxes increases the Gini coefficient by 0.03 points. In addition, per capita indirect taxes have a negative and statistically significant effect on the Gini coefficient. A one percent increase in per capita indirect taxes decreases the Gini coefficient by 0.03 points, suggesting that indirect taxes may reduce income inequality. Furthermore, the results suggest that the inflation rate positively and significantly impacts the Gini coefficient. A one percent increase in the inflation rate increases the Gini coefficient by 0.0003 points. Per capita subsidies negatively impact the Gini coefficient.

Table 6. GMM estimation for model 2.

Variable	Without Subsidy		With Subsidy	
	Coefficient	Prob.	Coefficient	Prob.
L.Gini (-1)	0.124	0	0.105	0
LDirect Tax	0.025	0.04	0.052	0.018
LIndirect Tax	-0.033	0	-0.022	0.015
LUE	0.044	0	0.039	0
LGDP	0.03	0	0.031	0
LInf	0.0003	0	0.001	0
LSub	-	-	-0.074	0
Inst. Rank	31		31	
J-statistic	28.5 (0.28)		28.6 (0.26)	

Source: research findings

5.5.3 | Model 3: with and without subsidies

To further evaluate the variables influencing income distribution, *Model (3)* was fitted both with and without the inclusion of the subsidy variable. The results are presented in *Table 7*. A critical indicator in the GMM estimation is the Sargan test for over-identifying restrictions. The test statistic exceeds 0.05, suggesting that the instrumental variables selected for the model are valid.

Based on *Table 7*, the impact of components of direct taxes on income distribution is illustrated. In this context, the logarithm of corporate income tax and the logarithm of personal income tax have a negative effect on the Gini coefficient, while wealth tax has a positive effect. Additionally, the impact of wealth tax on the Gini coefficient is statistically significant and positive. An increase of 1% in wealth tax is associated with an increase of 0.019 units in the Gini coefficient. According to *Table 7*, the effect of corporate income tax on the Gini coefficient is statistically significant and negative. A 1% increase in corporate income tax leads to a decrease of 0.01 units in the Gini coefficient. The effect of personal income tax on the Gini coefficient is negative but statistically insignificant. The impact of indirect taxes on the Gini coefficient has been found to be negative and statistically significant. A 1% increase in the inflation rate results in a decrease of 0.004 units in the Gini coefficient. In other words, the effect of indirect taxes on the Gini coefficient, which measures income inequality, shows a positive correlation. This implies that indirect taxes tend to increase income inequality, as measured by the Gini coefficient.

Table 7. GMM estimation for model 3.

Variable		Without Subsidy		With Subsidy	
		Coefficient	Prob.	Coefficient	Prob.
L.Gini (-1)		0.135	0	0.142	0
Direct	0.04	-0.012	0.005	-0.012	0.014
Tax	LPersonal Income Tax	-0.008	0.554	-0.005	0.748
	LWealth Tax	0.019	0.033	0.022	0.04
Indirect Tax	LTax on Goods and Services	-0.004	0	-0.004	0.008
LUE		0.019	0.001	0.019	0.003
LGDP		0.026	0	0.028	0
LInf		0.0002	0.003	0.0003	0.052
LSub		-	-	0.008	0.666
Inst. Rank		31		31	
J-statistic		27.4 (0.24)		28.6 (0.26)	

Source: research findings

6|Conclusion and Recommendations

Several factors can influence changes in the Gini coefficient, making the identification of these factors and their effects significant. Economic growth is one of the most important factors that can have a crucial impact on the Gini coefficient. The objective of this study is to analyze the effect of economic growth on income distribution using the GMM approach with data from 31 provinces of the country between 2006 and 2022.

The results from the estimation of the first model indicate that government per capita (current) expenditures have a negative and significant impact on the Gini coefficient. It can be explained that when government expenditures target low-income groups, it can lead to a reduction in overall income inequality. Studies have shown that countries with higher levels of government spending have lower Gini coefficients after fiscal intervention [40].

According to the findings of this study, per capita GDP has a positive impact on the Gini coefficient, which measures income inequality. For each unit increase in per capita GDP, the Gini coefficient increases. This aligns with findings by Barro [41], which indicate that wealthy countries exhibit a positive relationship between the Gini coefficient and per capita GDP growth [42].

The results of this study show that higher unemployment rates are associated with greater income inequality. This is because unemployment disproportionately affects low-income individuals, exacerbating existing disparities in income distribution. Empirical analyses have demonstrated that the unemployment rate significantly impacts the Gini coefficient. For example, one study showed that for every percentage increase in the unemployment rate, the Gini coefficient increases, reflecting worsening income inequality [43].

Additionally, rising unemployment negatively impacts household incomes, leading to a more unequal income distribution. In other words, any increase in unemployment or underemployment contributes to worsening income distribution inequality through an increase in the number of low-income individuals.

According to the findings of this study, per capita bank loans have a positive impact on the Gini coefficient. However, per capita bank loans can improve income distribution only if they promote entrepreneurship and provide financial resources for low-income individuals.

The findings also indicate that per capita subsidies have a negative and significant effect on the Gini coefficient. The relationship between subsidies and inequality is complex and depends on factors such as targeting and distribution of subsidies. Poorly designed or implemented subsidy programs may not effectively reduce inequality. Careful policy design to maximize the inequality-reducing effects of subsidies is crucial. This finding aligns with the study by Pahlavani et al. [44].

Results from the second model indicate that direct taxes have a positive effect on the Gini coefficient. High rates of direct taxes may discourage individuals from working harder or investing in their education and skills. In some contexts, the structure of direct taxation may disproportionately affect certain income groups. Studies have shown that increases in direct taxes can correlate with higher Gini coefficients, indicating greater income inequality. The relationship between direct taxes and economic growth also plays a role in income distribution. High direct taxes may reduce investments in human capital and innovation, which are vital for economic growth. A stagnant economy may not create upward mobility opportunities, thereby perpetuating income inequality over time.

Furthermore, the impact of indirect taxes on the Gini coefficient has been found to be negative and statistically significant. Indirect taxes can provide substantial revenue for governments, which can be used to finance essential public services such as healthcare, education, and infrastructure. By improving access to these services, indirect taxes can indirectly benefit low-income groups and potentially reduce inequality. On the other hand, some studies suggest that indirect taxes may stimulate economic growth. A growing economy can provide more opportunities for upward mobility, which may help balance income distribution over time [45].

Individuals with higher incomes generally tend to consume less compared to those with lower incomes. Therefore, indirect taxes may affect spending patterns in a way that disproportionately burdens low-income individuals. If high-income individuals pay a larger share of indirect taxes due to their higher consumption levels, this could lead to a more equitable distribution of the tax burden [46].

The positive and significant impact of inflation on the Gini coefficient has also been established. According to the study by Thalassinos et al. [47], inflation has a statistically significant positive effect on income inequality. For instance, an analysis of inflation and inequality in 13 European countries from 2000 to 2009 showed a positive correlation between inflation and the Gini coefficient, indicating that higher inflation rates are associated with increased income inequality. This suggests that countries experiencing higher inflation tend to have greater levels of income inequality, as reflected in their Gini coefficients. Inflation can alter wage structures, disproportionately affecting low-income groups who may not benefit from rising prices in the same way wealthier individuals do. This wage disparity exacerbates income inequality and contributes to a higher Gini coefficient. While some studies suggest that the effects of inflation on inequality may vary over time, the overall trend indicates that persistent inflation tends to benefit wealthier individuals more than poorer ones, leading to an increase in the Gini coefficient in the long term.

The results from the third model indicate that the examination of the implementation of direct and indirect taxes shows that the effect of wealth tax on the Gini coefficient is significantly positive. The effect of corporate income tax on the Gini coefficient is significantly negative. Well-structured income tax systems can lead to a fairer income distribution, thereby reducing the Gini coefficient. The effect of corporate income tax, which constitutes a major share of government tax revenues, on income distribution is positive, meaning that an increase in this tax has a significant impact on improving income distribution. However, it should be noted

that if this tool is inefficient, it could have severe consequences for the country. Additionally, the results indicate that the impact of taxes on goods and services on the Gini coefficient is significantly negative. If tax policies can levy higher taxes on higher-income individuals compared to lower-income individuals, it would be advisable.

The results of this study indicate a positive and significant impact of inflation on the Gini coefficient. As expected, an increase in the inflation rate in the country has led to worsening income distribution and class gaps, highlighting the necessity for the implementation of stabilizing and appropriate policies by the government.

The results of the first model regarding the impact of government per capita expenditures align with the findings of the studies Guzi and Kahanec [48], which demonstrated that "government expenditures have a negative impact on the Gini coefficient of the provinces of the country, leading to a reduction in income inequality in these provinces".

The results of the second model of this research align with the findings of the study by Dehshiri et al. [49] and Gu [43], which indicate that the effects of the inflation index and the unemployment index negatively impact the improvement of income distribution in selected countries, leading to increased income inequality.

The findings of this thesis are consistent with the study conducted by Hayrullahoglu and Tuzun [50] regarding the positive impact of indirect taxes (such as taxes on goods and services) on the Gini coefficient.

Furthermore, the results of this study align with the findings of Razzaque et al. [51], Dehshiri et al. [49], and Fang [52] concerning the positive effects of direct taxes on the Gini coefficient.

Additionally, the results are consistent with the findings of Busra et al. [45] and Karabulut [46], which indicate a negative impact of indirect taxes on the Gini coefficient.

Policy recommendations

Consequently, the policy recommendation derived from the first model of this research is to increase per capita subsidies, which could lead to a reduction in the Gini coefficient. Increasing this variable can assist in improving income distribution. Utilizing a combination of financial resources, such as tax revenue and lump-sum taxes, can help ensure sufficient and sustainable funding for subsidies.

To reduce income inequality across provinces, it is essential to allocate capital and operational budgets to provide public services and expand infrastructure in those regions.

Considering the significant positive impact of per capita GDP on the Gini coefficient, governments can work towards reducing income distribution inequality by increasing economic resources. This can be achieved by investing more in education, healthcare, infrastructure, and social assistance programs, ultimately contributing to overall social welfare.

Regarding banking facilities, based on the results of this research, it is necessary to reduce government involvement in banks. By fostering a competitive environment within the country's banking system and enhancing the efficiency of provided facilities within regulatory frameworks and through expert assessments, it is crucial to prevent the transfer of loans and credits to inefficient economic sectors that do not create added value, and instead direct these resources towards productive activities.

Acknowledgments

The author acknowledges the valuable perspectives offered during the peer-review process, which contributed to enhancing the analytical rigor and presentation of the study. Appreciation is also extended for the editorial efforts that supported the refinement of this manuscript.

Funding

The author confirms that this research was carried out without financial support from any external funding sources.

Data Availability

The analysis is based on provincial-level data for Iran over the period 2006–2022, compiled from official statistical sources. The dataset and estimation outputs can be provided by the author upon justified request.

Conflicts of Interest

The author declares that there are no competing interests that could have influenced the results of this research.

References

[1] Partridge, M. D. (1997). Is inequality harmful for growth? Comment. *The american economic review*, *87*(5), 1019–1032. https://www.jstor.org/stable/2951339

[2] Li, H., Squire, L., & Zou, H. F. (1998). Explaining international and intertemporal variations in income inequality. *Economic journal*, *108*(446), 26–43. https://doi.org/10.1111/1468-0297.00271

[3] Forbes, K. J. (2000). A reassessment of the relationship between inequality and growth. *American economic review*, *90*(4), 869–887. https://doi.org/10.1257/aer.90.4.869

[4] Alesina, A., & Rodrik, D. (1994). Distributive politics and economic growth. *Quarterly journal of economics*, *109*(2), 465–490. https://doi.org/10.2307/2118470

[5] Galor, O., & Tsiddon, D. (1997). Technological progress, mobility, and economic growth. *The american economic review*, *87*(3), 363–382. https://www.jstor.org/stable/2951350

[6] Persson, T., & Tabellini, G. (1991). ls lnequality harmful for growth. *American economic re view (june 1994)*, *84*(3), 600–621. B2n.ir/q18789

[7] Fallah, B. N., & Partridge, M. (2007). The elusive inequality-economic growth relationship: are there differences between cities and the countryside? *Annals of regional science*, *41*(2), 375–400. https://doi.org/10.1007/s00168-006-0106-2

[8] Panizza, U. (2002). Income inequality and economic growth: Evidence from American data. *Journal of economic growth*, *7*, 25–41. https://doi.org/10.1023/A:1013414509803

[9] Attanasio, O. P., Picci, L., & Scorcu, A. E. (2000). Saving, growth, and investment: A macroeconomic analysis using a panel of countries. *Review of economics and statistics*, *82*(2), 182–211. https://doi.org/10.1162/003465300558731

[10] Kuznets, S. (1955). International differences in capital formation and financing. In *Capital formation and economic growth* (Vol. I, pp. 17–110). Princeton University Press. https://www.nber.org/system/files/chapters/c1303/c1303.pdf

[11] Keskin, A. (2017). Income distribution and economic growth: A complementary cross country study to the kuznets curve. *Afyon kocatepe üniversitesi sosyal bilimler dergisi*, *19*(2), 235–250. https://dergipark.org.tr/tr/pub/akusosbil/378538%0Ahttp://dergipark.gov.tr/download/article-file/403962

[12] Kaldor, N. (1955). Alternative theories of distribution. *Review of economic studies*, *23*(2), 83–100. https://doi.org/10.2307/2296292

[13] Sameti, M., & Rafie, L. (2010). Interaction of income distribution, taxes and economic growth (the case of Iran and some selected East Asian countries). *Iranian economic review*, *14*(25), 67–81. http://search.ebscohost.com/login.aspx?direct=true&db=ecn&AN=1136372&site=bsi-live

[14] Mdingi, K., & Ho, S. Y. (2021). Literature review on income inequality and economic growth. *MethodsX*, *8*, 101402. https://doi.org/10.1016/j.mex.2021.101402

[15] Galor, O., & Zeira, J. (1993). Income distribution and macroeconomics. *Review of economic studies*, *60*(1), 35–42. https://doi.org/10.2307/2297811

[16] Piketty, T. (1997). The dynamics of the wealth distribution and the interest rate with credit rationing. *Review of economic studies*, *64*(2), 173–189. https://doi.org/10.2307/2971708

[17] Banerjee, A. V., & Duflo, E. (2003). Inequality and growth: what can the data Say? *Journal of economic growth*, *8*(3), 267–299. https://doi.org/10.1023/A:1026205114860

[18] Vieira, J. R., de Assis Libânio, G., & Cardoso, D. F. (2023). *Economic growth, income distribution, and financial system: an analysis based on financial social accounting matrices for the brazilian economy economy*. https://ideas.repec.org/p/cdp/texdis/td664.html

[19] De Azevedo, L. F., Fonseca, P. C. D., & Missio, F. J. (2022). Income distribution and economic growth regime in Brazil: evaluation and propositions. *Brazilian journal of political economy*, *42*(1), 25–47. https://doi.org/10.1590/0101-31572021-3244

[20] Dollar, D., & Kraay, A. (2002). Growth is good for the poor. *Journal of economic growth*, *7*, 195–225. https://doi.org/10.1023/A:1020139631000

[21] Amitrano, C. R., & Vasconcelos, L. (2019). Income distribution, inflation and economic growth: A post-Keynesian approach. *Panoeconomicus*, *66*(3), 277–306. https://doi.org/10.2298/PAN1903277A

[22] Brueckner, M., & Lederman, D. (2018). Inequality and economic growth: The role of initial income. *Journal of economic growth*, *23*(3), 341–366. https://doi.org/10.1007/s10887-018-9156-4

[23] Piketty, T., Saez, E., & Zucman, G. (2018). Distributional national accounts: methods and estimates for the United States. *Quarterly journal of economics*, *133*(2), 553–609. https://doi.org/10.1093/qje/qjx043

[24] Zaman, K., & Shamsuddin, S. (2018). Linear and non-linear relationships between growth, inequality, and poverty in a Panel of Latin America and the Caribbean countries: A new evidence of pro-poor growth. *Social indicators research*, *136*(2), 595–619. https://doi.org/10.1007/s11205-017-1581-9

[25] Nobahar E, Panahi H, M. Z. (2023). Investigating the relationship between income inequality, urbanization, and economic growth in provinces of Iran. *Quarterly planning and budgeting*, *28*(1), 97-122. (**In Persian**). https://doi.org/10.61186/jpbud.28.1.97

[26] Esfandiari, M., & Rahimi, M. (2022). The impact of relative redistribution on economic growth. *Development strategy*, *18*(3), 21-49. (**In Persian**). https://www.sid.ir/paper/1041572/fa

[27] Shahiakitash, M. and Alizadeh, S. (2021). Assessing the relationship between poverty, income distribution and economic growth in Iran (FLSR Fuzzy approach). *Journal of applied economics studies in iran*, *10*(38), 39–54. https://doi.org/10.22084/aes.2021.23461.3239

[28] Maaboudi, R. and Dare Nazari, Z. (2021). The relation of financialization with the income distribution and economic growth in Iran. *Economics research*, *21*(82), 49-90. (**In Persian**). https://doi.org/10.22054/joer.2022.60674.970

[29] Vo, D. H., Nguyen, T. C., Tran, N. P., & Vo, A. T. (2019). What factors affect income inequality and economic growth in middle-income countries? *Journal of risk and financial management*, *12*(1), 40. https://doi.org/10.3390/jrfm12010040

[30] Bond, S. (1991). Some tests of specification for panel data:monte carlo evidence and an application to employment equations. *Review of economic studies*, *58*(2), 277–297. https://doi.org/10.2307/2297968

[31] Mátyás, L., & Sevestre, P. (1992). *The econometrics of panel data: handbook of theory and applications* (Vol. 28). Springer Science & Business Media. https://books.google.com/books/about/The_Econometrics_of_Panel_Data.html?id=3L9nQgAACAAJ

[32] Phillips, P. C. B., & Sul, D. (2003). Dynamic panel estimation and homogeneity testing under cross section dependence. *The econometrics journal*, *6*(1), 217–259. https://doi.org/10.1111/1368-423x.00108

[33] Pesaran, M. H. (2003). Estimation and inference in large heterogenous panels with cross section dependence. *Available at ssrn 385123*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=385123

[34] Zaranezhad, M., Anvari, E., & Halafi, H. (2018). Economic resilience index and studying its effects on Iran's economic growth. *Journal of critical literature and humanities*, *18*(9), 167-193. (**In Persian**). https://sid.ir/Paper/235195/En

[35] Aghaei, N., Moshiri, K., & Shahrbanian, S. (2012). Relationship between organizational justice and intention to leave in employees of sport and youth head office of Tehran. *Library*, *2*(5), 1564–1570. https://www.researchgate.net/profile/Shahnaz-Shahrbanian/publication/311821933_Relationship_between_organizational_justice_and_job_burnout_in_employees_of_Sport_and_Youth_Head_Office_of_Tehran/links/5a340974a6fdcc769fd22818/Relationship-between-organizati

[36] Pesaran, M. H., Schuermann, T., & Weiner, S. M. (2004). Modeling regional interdependences using a global error-correcting macroeconometric model. *Journal of business and economic statistics*, *22*(2), 129–162. https://doi.org/10.1198/073500104000000019

[37] Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of econometrics*, *108*(1), 1–24. https://doi.org/10.1016/S0304-4076(01)00098-7

[38] Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of econometrics*, *115*(1), 53–74. https://doi.org/10.1016/S0304-4076(03)00092-7

[39] Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335–346. https://doi.org/10.1093/biomet/75.2.335

[40] Martin, G., & Martin, K. (2018). *Income inequality and the size of government: A causal analysis*. MUNI ECON Working Papers. https://doi.org/10.5817/wp_muni_econ_2018-02

[41] Barro, R. J. (2000). Inequality and growth in a panel of countries. *Journal of economic growth*, *5*(1), 5–32. https://doi.org/10.1023/A:1009850119329

[42] Kandek, B., & Kajling, V. (2017). Income Inequality and Economic Growth: What relation does regional income inequality have with local economic growth in US Metropolitan Areas?

[43] Gu, W. (2023). An empirical analysis of the impact of unemployment rate and economic development level on income inequality. *Empirical economic bulletin, an undergraduate journal*, *16*(1), 5. https://digitalcommons.bryant.edu/eeb/vol16/iss1/5/

[44] Pahlavani, M., Heydarian, S., & Mirjalili, S. H. (2021). The impact of financial sanctions on income inequality in Iran: The TVP-FAVAR model. *The journal of economic policy*, *13*(25), 213-239. (**In Persian**). https://doi.org/10.22034/epj.2021.15377.2141

[45] Büşra, Ö., Hale, B., & Fulya, Ç. (2023). The effect of indirect taxes on income distribution: An empirical analysis of Türkiye. *Journal of public finance studies*, *70*, 84–104. https://doi.org/10.26650/mcd2023-1350457

[46] Karabulut, Ş. (2020). Impact of indirect taxes on income distribution. *Selçuk üniversitesi sosyal bilimler meslek yüksekokulu dergisi*, *23*(1), 92–100. https://doi.org/10.29249/selcuksbmyd.618155

[47] Thalassinos, E., Uğurlu, E., & Muratoğlu, Y. (2012). Income inequality and inflation in the EU. *European research studies journal*, *15*(1), 127–140. https://doi.org/10.35808/ersj/347

[48] Guzi, M., & Kahanec, M. (2018). *Income inequality and the size of government: A causal analysis*. https://www.econstor.eu/handle/10419/214860

[49] Dehshiri, H. M., Pajouyan, J., Hosseini, S., & Ghaffari, F. (2020). Analyzing the impact of fiscal policy (income tax) on income distribution in Iran by autoregressive distributed lag (ARDL) approach. *Journal of Money and Economy*, *15*(2), 221-234. https://jme.mbri.ac.ir/article-1-323-fa.pdf

[50] Hayrullahoglu, B., & Tuzun, O. (2020). The effect of taxes on income distribution: An analysis for Turkey and other selected OECD countries. *Proceedings of the third economics, business and organization research (EBOR) conference* (pp. 413–426). Economics Business And Organization Research. https://dergipark.org.tr/en/pub/ebor/issue/58610/849960

[51] Razzaque, M. A., Rahman, J., Rabi, R. I., Islam, D., & Eusuf, A. (2023). *Using direct taxation to boost revenue and tackle inequality: A political economy analysis*. https://www.theigc.org/sites/default/files/2023-10/Razzaque et al Working paper January 2023.pdf

[52] Fang, W. (2024). Negative impact of income tax on economic growth. *SHS web of conferences* (Vol. 188, p. 02003). EDP Sciences. https://doi.org/10.1051/shsconf/202418802003