Original Research Article

Analyzing the Impact of Fiscal Policy (Income Tax) on Income Distribution in Iran by Autoregressive Distributed Lag (ARDL) Approach

Hassan Mollaesmaeili Dehshiri[*]   **Jamshid Pajouyan**[†]
Shamseddin Hosseini[‡]   **Farhad Ghaffari**[§]

Economic justice and equitable distribution of income, along with important issues such as economic growth and development, the reduction of inflation and unemployment, have always been of concern to economists. Fair distribution of income and reduction of income inequality in society, and the identification of factors affecting income inequality to make the right policy are necessary and obvious. The purpose of this paper is to examine the impact of income tax on income distribution in Iran. In this regard, Autoregressive Distributed Lag (ARDL) approach has been used to investigate the existence of a long-run relationship between variables and to estimate the coefficients related to long-run and error correction models for income inequality from 1978 to 2012. The results indicate a long-run relationship among the variables and show that an increase in income tax revenues leads to a reduction in income inequality.

Keywords: Income Distribution, Gini Coefficient, Income Tax, ARDL.
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1 Introduction

Poverty is one of the similarities among developing countries, and it is a problem that most societies have faced at different periods. Poverty also

[*] Department of Management and Economics, Science and Research Branch, Islamic Azad University, Tehran, Iran; hmesmaili@gmail.com
[†] Department of Management and Economics, Science and Research Branch, Islamic Azad University, Tehran, Iran; j-pazhouyan@srbiau.ac.ir (Corresponding Author)
[‡] Department of Economics, Allameh Tabataba'i University, Tehran, Iran; sh-hoseini@srbiau.ac.ir
[§] Department of Management and Economics, Science and Research Branch, Islamic Azad University, Tehran, Iran; ghaffari@srbiau.ac.ir

causes many other problems, such as increased mortality, declining fertility, insecurity, corruption, etc. The size and extent of poverty depend on two factors in each country: the first is the average level of national income, and the second is the degree of inequality in income distribution. It is clear that at any level of per capita national income, the more unfair the income distribution, the higher the poverty rate (Todarou, 2004). Unequal income distribution increases the class gap and reduces motivation to work, and it also causes widespread poverty, political tensions, and comprehensive corruption.

There are degrees of income inequality in all countries of the world, and there are many differences between the rich and the poor in both groups of developed and developing countries. However, the gap between the rich and the poor in less developed countries is usually larger than in developed countries. Hence, the need for research and analysis of the factors affecting income inequality becomes apparent. Because by researching and identifying the factors affecting inequality and creating a series of policy and planned strategies for decreasing inequality and implementing policies, it will reduce poverty and solve many problems of society. Taxation as a tool of government fiscal policy is one of the factors influencing income distribution. In any economic system, tax is considered as one of the most important pillars of that system. Expanding and diversifying economic activities, and increasing the role of governments to create and expand public services, social security, etc. and its commitments in the economic and social aspects, have made taxes a vital issue for the fulfillment of economic growth and fair income distribution (Faramarzi et al., 2016).

This paper investigates the impact of income tax on the Gini coefficient as an income distribution index in Iran to provide better solutions and policies to improve income distribution. This study's distinctive aspects are the timespan, research method, and, most importantly, the survey of an existing long-term relationship between the dependent variable and the main research variable. The research on income distribution in Iran and its influence on income tax has been done from 1978 to 2012. The research hypothesis is that the income tax has a negative and significant impact on the Gini coefficient index.

In the following, at first theoretical bases are explained. Experimental studies in this field are then studied. In the next section, based on theoretical bases and experimental studies, the model is presented, and the variables are defined. The results are then discussed. In the end, the conclusion and policy solutions are presented to improve income distribution.

2 Literature Review

There is no doubt that from a long-time ego, income distribution has been one of the most important economic debates. It has been considered one of the most important indices of economic development by macroeconomic policymakers. The issue of income distribution and social justice has long been a concern for all human societies. Based on the economic principles, widespread inequality in income distribution leads to poverty and increases its scope. Of course, without the same opportunities and abilities, talking about equal income is absurd, but a large difference in the class gap is also a feature of an unhealthy economy. (Rezagholizadeh & Aghaei, 2015).

The importance of the fair distribution of income, opportunities, and economic facilities is not hidden from anyone. Some indices explain income distribution, one of the most important of which is the Gini coefficient. The coefficient value varies between zero and one. The closer to zero means the fairer the distribution of wealth and the closer to one means the wealth is limited to wealthy people and an inequality income distribution. According to this, the countries with a Gini coefficient of more than 0.5 are the countries with unequal income distribution. The countries with a Gini coefficient between 0.4 and 0.5 are countries with less unequal income distribution. Finally, the countries with a Gini coefficient of less than 0.4 are the ones with fair income distribution (World Bank, 2014; Rezagholizadeh & Aghaei, 2015).

2.1 Relation between Tax and Income Distribution

One of the government's economic responsibilities is the proper distribution of income and wealth, which is achievable through fiscal policy. The unequal distribution of income and wealth in society will raise economic, social, and political problems. Various factors influence the income distribution level, such as economic growth and development, demographic factors, political factors, historical factors, cultural and natural factors, and macroeconomic factors (Azarbayejani et al., 2014). Political and macroeconomic factors have a direct impact on income distribution. Fiscal policies are one of these factors. Making tax policies as a tool of fiscal policy has different functions.

On the one hand, tax is an income source for the government, and on the other hand, it is a policy to correct a market error. Also, tax policy is a tool to improve income distribution. Musgrave (1959) has stated that tax plays different roles in the economy: stabilization, allocation, and income distribution. Stabilization refers to the government's responsibility in

motivating economic activities and consumption. Allocation refers to providing goods and public services, and income distribution refers to transferring wealth from the rich to the poor to have an equal society. The impact of tax on income distribution depends on the adopted tax system in terms of direct and indirect taxes. In most countries, direct tax includes individuals' income tax, wealth, and companies. Personal income tax is applied as progressive rates on effective income after certain exempted levels. In the absence of tax evasion, this type of tax is for redistribution of income, and it is consistent with the payability principle. Wealth tax is applied according to individuals' cumulative wealth. It increases the progressive aspect of taxes, especially in high-income groups because net wealth tax accompanied by income tax distributes taxes better according to individual's pay-ability.

Also, the net wealth tax by redistributing the wealth, preventing wealth progressing, and encouraging effective use of assets can be imposed as a tool to do economic and social modifications. The impact of tax on companies' income is U-shaped. That means it is destructive for large and small companies and improves the income distribution in medium-sized companies. In contrast, indirect taxes have a damaging impact on income distribution. In its simplest form, the same rate for all taxable transactions is considered. Since the marginal propensity to the consumption of commodities for lower-income people is greater than the high-income people, it worsens income distribution. (Seifeepour and Rezaee, 2011).

In the case of income tax, if progressive tax is applied to income, it effectively improves the income distribution in a society (Pajouyan, 2006). There is no tax base better than income tax for performing progressive rates. Performing a progressive tax system, especially with final progressive rates, is not applicable for the bottom of consumption and expense tax. Some economists evaluate the general tax on consumption with a fixed rate from the household sources' point of view as a descending average rate. Considering that this point of view is one of the controversial subjects between advocates and opponents of consumption tax regarding income distribution. It could be acknowledged that general consumption taxes cannot play a positive role in improving income distribution and reducing poverty. That is why selective taxes on consumption are applied, making the market of luxury goods with high tax rates.

On the other hand, it should be noted that income taxes, except the tax on total income, which mostly includes the tax on salary and wage and tax on the companies' profit, are considered taxes on the inputs market. They often cause

incorrect and ineffective allocation of resources and greatly influence the economic efficiency. These taxes reduce net returns of inputs and have stronger destructive impacts if applied with a progressive rate. The impacts of income tax will appear as a selection between consumption and saving, but it does not significantly impact work and capital inputs. Total income is the result of a person's real income and earned from income resources such as capital, labor, rent, etc., reflecting the person's general welfare and income. Therefore, it is clear that if progressive taxes are applied on income, it is greatly effective in improving the income distribution in a society.

3 Research Background

Palm (1996) examines the impact of Sweden's tax modifications in 1991 on the Gini coefficient. Studying both periods of before and after-tax modifications, he concludes that tax modifications lead to balanced income distribution. Chu, Davoodi, and Gupta (2002) examine the income distribution and tax in developing countries and countries in transition. The results show that income distribution before taxing is relatively equal in developing countries than in industrial countries. Although in contrast to industrial countries, developing countries generally cannot decrease the income inequality using taxes and transitional policies.

Borge and Rattso (2001) investigated the importance of tax structure on income distribution. They studied the tax structure in Norway's local government and investigated the distributive impact of taxation on consumption and wealth. Their finding shows that although the tax on consumption includes a large portion of the tax, the wealth tax has a more distributive impact.

Ramirez (2002) examined the government's desirable behavior to use fiscal policies for the redistribution of income. He has used a stochastic dynamic general equilibrium model to find the differences of impact of permanent and temporary disorder of optimal tax on one hand; and the relationship between primary inequality and applying a tax on income distribution on the other hand. The results show that primary inequality has a great impact on applying a tax on income distribution. It also indicates that tax rate influences the inequality of income distribution. They examine the direct impact of taxes and the change in taxes' structure on income distribution in Chile. This study shows that taxes had little impact on income distribution (Gini coefficient before tax was 48% and after it, was 49%). A fundamental adjustment in taxes, such as increasing the value-added tax from 18% to 25% and the change in

the progressive income tax to the 20% tax, has slightly changed income distribution.

Qiang Chu et al. (2002) studied the income distribution of developing countries in recent decades before and after-tax. They indicated that the Gini coefficient after applying tax is, on average, less than the Gini coefficient before tax. This distribution improvement in industrial countries is more than in developing countries because of their tax structure.

Pajouyan and Eskandari (2012) studied the expected impacts of the reintroduction of tax on total income in Iran's economy. In their research, the tax condition of some selected countries from the Middle East and North of Africa (Egypt, Jordan, Morocco, Tunisia, and Cyprus) was studied for a period of eight years from 2002 to 2009. This study suggests that applying a tax on total personal income in the selected countries negatively impacts income distribution.

Abounoori and Khoshkar (2009) analyzed the impact of macroeconomic indices on income distribution in Iran. They concluded that per 1% increase in total received taxes from each household, there is a 0.81% increase in the subsequent year's inequality level. Komeijani and Fahim Yahyaie (1991), in an analysis of tax combinations and estimation of Iran's tax capacity, suggest that the process of tax combination and its collection in terms of direct and indirect taxes during 1971 to 1989 was not biased.

Rezagholizadeh and Aghaie (2015) in a study about Iran during 1978-2012, with the ARDL method, found that people's income tax has improved income distribution and has reduced inequality of various income deciles.

4 Methodology and Model

One of the dynamic models used for showing the static long-term relation between explanatory and dependent variables is the Auto Regressive Distributed Lag (ARDL). This model has achieved a relatively unbiased assessment for long-term coefficients when there is no structural failure in the data series. One of the ARDL approach's superiorities is that regardless of whether the variables are I(0) or I(1), the model is practical. Another reason is that it has more usable in small or limited samples compared to other methods such as Engle-Granger cointegration. It should be noted that the ARDL model is not used if there is a time series of I(2) in the model (Shahbaz Akmal, 2007).

According to presented theoretical discussions on the influence of income tax on inequality and following Kammas and Lapatinas (2015), the research model is as equation (1):

$$gini_t = \beta_0 + \beta_1 \pi_t + \beta_2 pg_t + \beta_3 itax_t + \beta_4 gdp_t + \beta_5 ge_t + u_t \quad (1)$$

In which $gini$ is the Gini coefficient, π is inflation, and pg is population growth. Also, $itax$ is tax income, gdp is the gross domestic product, and ge is government expenses in billion Rials (IRR). All variables of this research have real values with the base year 2004. The Gini coefficient, income tax, gross domestic product, and government expenses are collected from the Central Bank of the Islamic Republic of Iran. The data on inflation and population growth rate has been collected from the World Bank during 1978-2012.

Table 1
Results of Unit Root Test

	Level ADF test statistics		1st difference test statistics	
Variables	With intercept and without trend	With intercept and trend	With intercept and without trend	With intercept and trend
$gini$	-3.560	-4.266	-6.998	-6.938
π	-4.734	-4.674	-6.484	-6.332
pg	-1.265	-2.359	-3.006	-3.315
$itax$	0.366	-2.573	-3.995	-4.022
gdp	-0.566	-4.391	-3.991	-3.916
ge	-0.088	-3.197	-3.196	-3.121
Critical value (5%)	-2.954	-3.557	-2.960	-3.562

Source: Research Findings

Table 2
Number of Optimal lags

Variable	Number of optimal lags
$gini$	2
π	0
pg	3
$itax$	3
gdp	2
ge	3

Source: Research Findings

4.1 Model Estimation

The model estimation has been done through the following steps by the ARDL method:

4.1.1 Unit Root Test

A random process is stationary when the average and variance are fixed during the time. The covariance between the two time periods is only dependent on the interval between two periods and has no relation to the real-time covariance calculation. The presence of non-static variables makes F and t-tests invalid, and regression becomes a spurious regression. Therefore, in the first step, the Augmented Dickey-Fuller (ADF) test examines the stationarity of the given time series, and its results are presented in Table 1. The stationarity test results in Table 1 show that inflation and Gini coefficient variables at a significance level of 0.05 are I(0), and other variables are I(1). Assuring that none of the variables are I(2) or more, then the model is assessed by the ARDL method.

4.1.2 Defining the Optimal lags

Usually, in the samples with less than 100 observations, Schwartz Bayesian Criteria (SBC) is used to determine the optimal lags for each variable so that too much freedom is not lost. The number of optimal lags based on the Schwartz Bayesian Criteria is presented in Table 2.

4.1.3 Dynamic ARDL Model Results

According to calculated lags in the previous section, the ARDL model results have been presented in Table 3. The variable elimination test is performed to check that a long-term equilibrium relationship in the above model is not spurious. The test is conducted in Microfit to obtain the given F by Pesaran et al. (2001). The F-test is used to determine the presence of long-term relations between variables. To confirm the existence of long-term relations, it should initially be defined whether variables are stationary regardless of whether I(0) or I(1). Shin, Pesaran, and Smith (2001) have presented the table of correct critical values for the F-test per the number of various regressors (K). Besides, this table varies if the ARDL model includes Y-intercept or not. For each K, two critical values (upper and lower limit) are presented.

   If all the variables are I(0), the lower critical value will be correct, which is the same critical value as standard tables. If all the variables are I(1), the upper critical value should be considered. If some variables are I(0) and I(1), the correct critical value will be between the lower and upper limit of the critical value. Therefore, if the F statistic is more than the upper critical value, definitely H_0 hypothesis is accepted based on cointegration. If the F statistic's value is in the mentioned scope (upper and lower limit), a conclusive conclusion is not possible.

Table 3
Model Estimation Using ARDL (2,0,3,3,2,3)

Variable	Coefficient	Standard Error	Probability
Gini (-1)	-0.39	0.168	0.03
Gini (-2)	0.23	0.141	0.12
Inf	-0.009	0.003	0.03
Pg	0.25	0.067	0.00
Pg (-1)	-0.48	0.141	0.00
Pg (-2)	0.43	0.133	0.00
Pg (-3)	-0.077	0.047	0.12
Itax	-0.026	0.013	0.07
Itax (-1)	0.002	0.017	0.88
Itax (-2)	0.034	0.018	0.08
Itax (-3)	-0.046	0.014	0.00
Gdp	0.081	0.037	0.04
Gdp (-1)	-0.12	0.037	0.00
Gdp (-2)	-0.11	0.041	0.01
Ge	0.048	0.021	0.04
Ge (-1)	0.058	0.013	0.00
Ge (-2)	0.013	0.014	0.35
Ge (-3)	-0.041	0.020	0.06
C	1.92	0.494	0.00
R-squared = 0.93			
R-Bar-squared = 0.84			
DW = 2.63			

Source: Research Findings

To decide about the F in the scope, it should be referred to the t-table presented by Pesaran et al. (2001). According to the significance of t, the presence or absence of long-term relationships should be observed. According to the variable eliminating test, the F- statistics is 3.71. According to the table and considering the number of regressors (K), which is 6, this value is more than the table's critical value, which is 3.199. Therefore, the presence of long-term relations is confirmed.

4.1.4 Error Correction Model Results
The existence of cointegration among a set of economic variables provides the basis for the statistical use of error correction models. The benefit of these models is that they relate the short-term fluctuation of variables to long-term equilibrium values. These models are partial adjustment models. By introducing a stable residual of a long-term relationship, short-time effective forces and the speed to get the long-term equilibrium value are measured. The model evaluation is done in two steps: the first step is to estimate the long-term relation and its verification. In the second step, the lag of long-term

relation residual is used as an error correction factor, and the model is evaluated. The error correction factor represents the estimation of the residual lag factor. If its sign is negative as expected, it indicates the error correction factor and the tendency to long-term equilibrium. This factor shows that a few percent of the dependent variable imbalance in each period has been adjusted, close to the long-term relationship (Teshkini, 2005).

The error correction model factor related to the factors effective on the Gini index is presented in Table 4. When the magnitude of the ECM coefficient is negative and less than a unit, it is significant, which confirms a long-term and meaningful relationship between variables. This coefficient shows that a few percent of the imbalance of the dependent variable has been adjusted in each period and gets close to a long-term relationship. Based on the results, the ECM coefficient is equal to -0.46.

Table 4
Error Correction Representation for the ARDL Model

Variables	Coefficient	Standard Error	Probability
dgini1	-0.23	0.14	0.11
dinf	0.009	0.003	0.02
dpg	0.25	0.067	0.00
dpg1	-0.35	0.093	0.00
dpg2	0.07	0.047	0.12
ditax	-0.02	0.013	0.07
ditax1	0.01	0.014	0.45
ditax2	0.04	0.014	0.00
dgdp	0.08	0.037	0.04
dgdp1	0.11	0.041	0.01
dge	0.04	0.021	0.03
dge1	0.02	0.023	0.26
dge2	0.04	0.020	0.05
dc	1.92	0.494	0.00
Ecm (-1)	-0.46	0.174	0.02
R-squared= 0.93			

Source: Research Findings

4.1.5 Estimation Results of Long-Run ARDL Model
Table 5 shows the results associated with the estimation of long-run coefficients.

Table 5
Coefficients of Long-Run ARDL Model

Variable	Coefficient	Standard Error	p-values
inf	0.008	0.004	0.06
pg	0.107	0.035	0.01
itax	-0.030	0.010	0.01
gdp	-0.134	0.032	0.00
ge	0.068	0.014	0.00
c	1.65	0.402	0.00

Source: Research Findings

4.1.6 Diagnostic Tests

Table 6 shows the results of diagnostic tests.

Table 6
Diagnostic Tests Results

Test	Statistic χ^2	Statistic F
Serial Correlation	1.509 (0.21)	2.579 (0.13)
Functional Form	1.469 (0.21)	0.653 (0.47)
Normality	0.323 (0.85)	-
Heteroscedasticity	0.798 (0.37)	0.767 (0.38)

Source: Research Findings

According to the obtained results, at a significance level of 0.05, the null hypothesis is that there is no serial auto-correlation, homoscedasticity, and normal distribution. The existence of a suitable subordinate form is not rejected. Therefore, the estimated model has passed the diagnostic tests successfully.

4.2 Discussion

The ARDL long-term coefficients results show that the inflation index with 0.008 value has a positive and significant effect on the Gini index, which means that increased inflation leads to an increase in income inequality in Iran. If proper increased wages do not accompany increasing prices, the purchasing power reduces, which results in a decrease in real wages and salaries. It will harm the low-income group population of society. The positive sign of inflation is consistent with theoretical expectations and previous studies. The population growth rate with a coefficient of 0.1 has a positive and significant effect on the Gini index. The population growth will hinder development if the facilities and requirements of social welfare are not proportional. When

there are no suitable conditions for employment and earning, the population exacerbates income inequality.

The income tax index with a coefficient of 0.3 has a negative and significant effect on the Gini index. The coefficient's negative sign means that the increased income due to income taxes reduces the Gini index. In other words, it reduces income inequality and improves income distribution. This result is consistent with previous empirical studies by Qiang Chu et al. (2000), Rezagholizadeh and Aghaei (2015). As mentioned earlier, in particular taxes, government fiscal policies are effective in reducing inequality and income redistribution. By imposing an income tax, the government can redistribute the income from the rich to the poor, especially if it is applied at an exponential rate. The effect of tax on income distribution depends on the type of adopted tax system in direct and indirect taxes. In the absence of tax evasion, people's income tax would be at exponential rates, redistribute income, and be consistent with the principle of pay-ability. There will be a higher tax for people with higher incomes in income tax with exponential rates, with improved distribution of income.

With a coefficient of 0.13, the GDP index has a negative and significant effect on the Gini index. This result is consistent with Rezagholizadeh and Aghaei (2015) study, which is based on Iran's time-series data. In general, an increase in GDP has positive results, such as increased total demand and employment that increase different deciles' income and reduce inequality.

The government expenditure index increases income inequality by a coefficient of 0.6. This result shows that rising government expenditures and policies have exacerbated inequality of income during the study period. With an increase in tax revenue, the government earns more income to spend in different sectors. Types of income allocated to different sectors have different effects on income distribution. Suppose one looks at government spending in different sectors. In that case, it is seen that the share of public expenditures is higher than health and education expenditures. Usually, public expenditures do not produce much efficiency in the economy. That is why high public spending compared to other sectors does not have the positive effect of government spending on income distribution. The impact of government spending on each sector can be separately studied beyond the scope of this article. Redistribution of tax revenue has an effective role in the equal distribution of income. And if it does not happen correctly and optimally, it reduces the positive effect of income tax on income distribution.

5. Conclusions

Tax as a powerful and effective fiscal policy tool plays an important role in advancing government goals. The part of the countries tax system in achieving social and economic goals is very bold. One of the main goals of the tax system is to improve income distribution. In this study, the impact of income tax on the Gini index as an index of income distribution from 1978 to 2012 in Iran was investigated using the Auto-Regressive Distributed Lag (ARDL) method. The research results show a significant negative effect of income tax on the Gini index. It means that increasing tax revenue through changing tax rates, due to the government's contraction fiscal policy, reduces income inequality. Similarly, based on the model estimation results, the following policies are recommended to improve the distribution of income:

- While identifying the tax bases that exacerbate the unequal distribution of income, as much as possible, the personal income tax base should be strengthened and replaced by inefficient tax bases.
- Paying attention to how public expenditures affect income inequality and adopting appropriate strategies to improve tax revenue redistribution.
- Adopting appropriate and operational policies to control inflation.

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