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EFFECT OF INCOME TAX ON INCOME DİSTRİBUTİON İN TÜRKİYE: EVİDENCE FROM DYNAMİC ARDL SİMULATİONS

Türkiye'de Gelir Vergisinin Gelir Dağılımı Üzerindeki Etkisi: Dinamik ARDL Simülasyonlarından Kanıtlar

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KADİR KARAGÖZ

Doç. Dr.,
Manisa Celal Bayar Üniversitesi,
İktisadi ve İdari Bilimler Fakültesi,
Ekonometri Bölümü,
Manisa/TÜRKİYE
kadir.karagoz@cbu.edu.tr
Orcid ID: 00000002-4436-9235

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Effect of Income Tax on Income Distribution in Türkiye: Evidence from Dynamic ARDL Simulations

Abstract

Poverty and distorted income distribution are one of the main socioeconomic problems of many underdeveloped and developing countries. Another factor that worsens the situation for these countries is the inequality in income distribution and the existence of large differences between income groups. In this case, while a large segment of society has a low share in the total income, a large portion of the total income falls into the hands of a small minority. One of the main duties of governments is to ensure justice in income distribution in society, and one of the main instruments they can use for this purpose is income tax policy. An effective and fair income tax policy will tax people in direct proportion to their income, thus preventing the concentration of wealth in a certain segment and helping to protect the poor.

In this study, which is about the impact of taxes on income distribution, the situation in Turkey is investigated using time series methods. Findings obtained from the analysis based on the dynamic ARDL model reveal that income tax in Turkey does not affect income distribution in the long term but has a significant but positive effect in the short term. In other words, income tax policy in Turkey has an increasing impact on income distribution disorder in the short term, causing a situation that is detrimental to the poor. Accordingly, it would be useful to take corrective measures by rearranging tax rates according to income brackets.

Keywords: Income Distribution, İncome Tax, Theil's T Statistics, Dynamic ARDL Simulations.

JEL codes: C22, E62, H23

Özet

Yoksulluk ve çarpık gelir dağılımı, az gelişmiş ve gelişmekte olan birçok ülkenin temel sosyoekonomik sorunlarından biridir. Bu ülkeler için durumu daha da kötüleştiren bir diğer faktör ise gelir dağılımındaki adaletsizlik ve gelir grupları arasında büyük farkların bulunmasıdır. Bu durumda toplumun büyük bir kesimi toplam gelirden düşük bir pay alırken, toplam gelirin büyük bir kısmı küçük bir azınlığın eline geçmektedir. Hükümetlerin temel görevlerinden biri toplumda gelir dağılımında adaleti sağlamaktır ve bu amaçla kullanabilecekleri temel araçlardan biri de gelir vergisi politikasıdır. Etkin ve adil bir gelir vergisi politikası, kişileri gelirleri ile doğru orantılı olarak vergilendirecek, böylece servetin belli bir kesimde yoğunlaşmasını önleyecek ve yoksulların korunmasına yardımcı olabilecektir.

Vergilerin gelir dağılımı üzerindeki etkisini konu alan bu çalışmada, Türkiye'deki durum zaman serisi yöntemleri kullanılarak araştırılmıştır. Dinamik ARDL modeline dayalı analizden elde edilen bulgular, Türkiye'de gelir vergisinin uzun dönemde gelir dağılımını etkilemediğini ancak kısa dönemde anlamlı ancak pozitif bir etkiye sahip olduğunu ortaya koymaktadır. Diğer bir deyişle, Türkiye'de gelir vergisi politikası kısa vadede gelir dağılımındaki bozukluğu artırıcı bir etkiye sahiptir ve yoksulların aleyhine bir duruma neden olmaktadır. Bu itibarla, vergi oranları gelir dilimlerine göre yeniden düzenlenerek düzeltici önlemler alınması faydalı olacaktır.

Anahtar Kelimeler: Gelir dağılımı, gelir vergisi, Theil's T istatistiği, dinamik ARDL simülasyonları.

JEL kodları: C22, E62, H23

Introduction

Widespread poverty is a persistent challenge in developing nations, and most societies encounter this issue at some point. Poverty often breeds other problems, including higher mortality rates, lower birth rates, instability, corruption, and more. The unequal distribution of wealth exacerbates class disparities, dampens work ethic, and can lead to widespread poverty, political unrest, and rampant corruption (Dehshiri et al., 2020). Income poverty also causes bad consequences for health. Poor people often do not have the means to lead a healthy life (Kawachi and Subramanian, 2014). The severity and prevalence of poverty in a country are determined by two factors: the overall national income and how evenly that income is distributed. For any given level of income per person, it's evident that the more unequal the income distribution, the greater the number of people living in poverty.

Inequality (injustice) in income distribution is a phenomenon that can be observed all over the world, in countries at all levels of development. The only thing that changes is the degree of distortion in income distribution. The social and economic transformation that accelerated in the 20th century, first with industrialization and then with globalization, has led to serious grievances among large segments of the population in many societies from west to east. Especially in a society that is trying to transition from agriculture to industry, the poverty experienced by people who cannot be employed by industry and who are therefore deprived of a continuous source of income is one of the most important of these victimizations. Reducing these and similar grievances in a transforming economy depends on economic decision-makers formulating and implementing policies to ensure that larger segments of the population can benefit from the gains of growth and welfare increases. One of the most important tools to achieve this is to create a "redistribution mechanism" that will reduce or eliminate the victimization of vulnerable groups through an effective and efficient tax system. This issue is particularly important for developing countries with excess income inequalities and diverse sources of inequality (Bayar et al., 2021).

The skewed distribution of income in a society, or in other words, the inequitable distribution of income, has the potential to cause many economic, social, and political problems. Recently, there has been an increase in income inequality across the world and the situation has worsened with the economic crises. Rising inequality raises concerns not only from a moral point of view but also because of its detrimental effects on development and welfare. High inequality can lead to rent-seeking activities, social tension, political instability, the existence of a poor middle electorate, imperfect capital markets, and a lower share of income for the middle class, slowing economic growth (Akalın, 2021).

Through its tax and benefit policies, a government can significantly impact the distribution of wealth and reduce poverty. This underscores the government's crucial role in addressing economic inequality. In numerous countries, the tax and transfer system can

exacerbate poverty, pushing a significant portion of the population further into poverty or even out of poverty altogether (Gupta and Jalles, 2022). Higgins and Lustig (2016) discovered that in at least ten out of twenty-five countries they examined, a quarter or more of the poor paid more in taxes than they received in government benefits. Taxation, a key component of a government's fiscal policy, significantly influences income distribution. It's considered a cornerstone of any economic system. As economies grow and diversify, and governments take on more responsibilities for public services, social welfare, and overall economic well-being, taxation becomes increasingly crucial for achieving both economic growth and equitable income distribution. Modern governments have employed tax policies not only to generate revenue but also to mitigate income inequality among their citizens (Biswas et al., 2017). One of the government's economic duties is to ensure a fair distribution of income and wealth, which can be accomplished through fiscal policy. Various factors, including demographic, political, historical, cultural, natural, and macroeconomic conditions, can affect income distribution. Political and macroeconomic factors exert a direct influence on income inequality (Dehshiri et al., 2020). Fiscal policies may also affect income distribution directly.

The tax system is the primary public policy tool used to influence the distribution of income after taxes are paid. Income taxes and payroll taxes are the most well-known components of the tax system. However, consumption taxes and corporate taxes, which ultimately impact households, also play a role in shaping the after-tax income distribution. (Poterba, 2007). Fiscal and, more specifically, tax policies, which have been shaped within the framework of economic and political conjuncture in the historical process in the world, have become one of the instruments of intervention of states in income distribution in today's world where liberal economic policies such as international trade and financial liberalization are applied. Many issues such as the distribution of the tax burden to which segments of the society and to what extent, which sectors and segments will benefit from the exceptions and exemptions to be applied according to the differences in tax burden and income distribution between regions, reveal the regulatory role of tax policy today (Ay and Haydanlı, 2018).

While taxation serves as a revenue source for governments, it also functions as a policy tool to address market failures and improve income distribution. Musgrave (1959) identified three key roles for taxation in the economy: stabilization, allocation, and income distribution. Stabilization involves government efforts to stimulate economic activity and consumption. Allocation refers to the provision of public goods and services. Income distribution involves the redistribution of wealth from the wealthy to the less fortunate to promote a more equitable society. The impact of taxation on income distribution is influenced by the specific tax system in place, particularly the balance between direct and indirect taxes (Dehshiri et al., 2020). If taxes are not proportional, the relative economic situation of households will be affected by income taxes. However, most countries are seeking a progressive income tax structure that would have the effect

of reducing income inequality between income classes of households classified for tax purposes (Zandvakili, 1994).

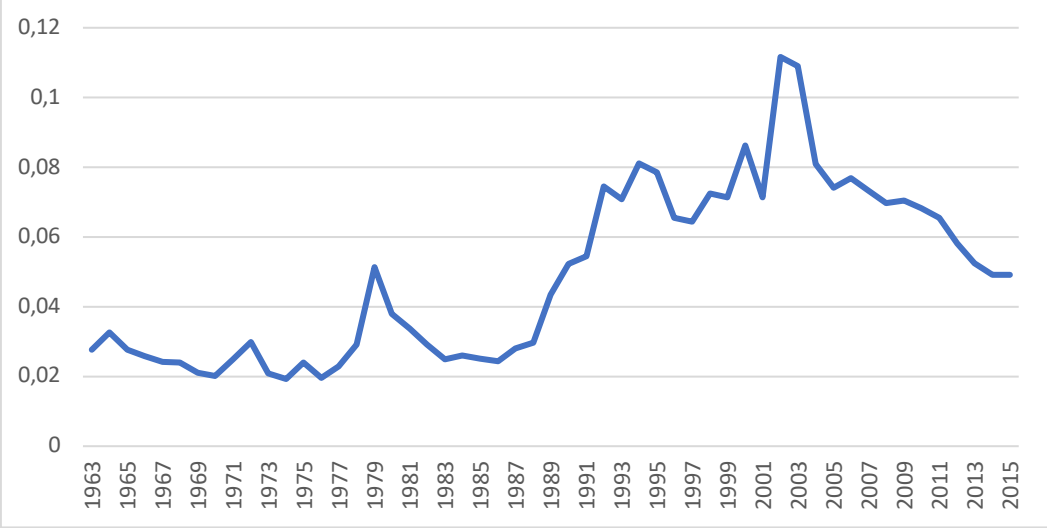


Figure 1: The course of Theil's T statistics for Türkiye between 1963 and 2015

Source: UTIP

Although successive governments in Turkey have declared the issue of justice in income distribution as a priority goal, it cannot be said that there has been any serious success in this regard. It is reflected in the statistics that the situation has worsened in recent years. The course of the Theil's T stattistics shows that income distribution in Turkey has gradually deteriorated, especially in the turbulence that emerged in the period following the COVID-19 pandemic (Figure 1). At this point, it is important to determine the effect of income tax on income distribution, which is theoretically proposed as a tool to regulate income distribution.

In this study, the effect of income tax on income distribution is investigated econometrically. As will be seen in the following section, the issue has been empirically addressed in many studies in Turkey. However, this study differs from previous studies in many respects. First, in previous studies, the distortion in income distribution is represented by the Gini coefficient. Here, Theil's T statistic is used for this purpose. Second, a longer period of data is used compared to previous studies. This allows for stronger inferences. Third, the dynamic ARDL method allows for a better interpretation of the results.

1. Related Empirical Literature

Although being an ancient phenomenon, income inequality has increased in many societies, including advanced economies, over the last four decades. This has stimulated considerable theoretical and empirical academic interest. Joumard et al. (2013) concluded

that taxes and transfers have a substantial impact on income redistribution. The Gini coefficient, used as the measure of income inequality, was approximately 25% lower after taxes and transfers were considered compared to before taxes and transfers in the OECD region during the late 2000s. Countries with a more unequal distribution of pre-tax income typically redistribute more. While the redistributive impact of household taxes varies less across countries compared to transfers, there are significant differences in tax-to-GDP ratios. High-tax countries tend to have less progressive household tax systems.

In recent years, Latin American nations, despite their diverse political leanings and economic systems, have experienced significant reductions in income inequality that are unmatched by other regions globally. In a panel data analysis for 18 Latin American countries, Cornia (2014) showed that the ratio of direct/indirect tax revenue is strongly and negatively associated with income inequality.

From an economic perspective, marginal tax rates are especially significant because they influence individuals' motivation to earn additional income. Economic theory suggests that proportional decreases in marginal tax rates will have a more substantial impact on incentives for higher-income earners. Consequently, even a uniform rate cut will lead to larger increases in income among those with the highest incomes. This implies that reductions in high marginal tax rates can contribute to an increase in observed income inequality. The findings of Gwartney and Lawson (2006) are supportive of this view. Their findings show that the income share of the highest group of earners tended to increase following major reductions in the highest marginal tax rates.

In some other studies, conflicting findings have been obtained. Using administrative tax data from a large Swiss canton, Hümbelin and Farys (2018) employed a Gini-based decomposition analysis to examine how various taxes and deductions affect the post-tax income distribution. Their findings revealed that tax deductions significantly diminish the redistributive impact of taxes, as lump sum deductions in a progressive tax system disproportionately benefit higher-income earners. Hyun and Lim (2002) examined the impact of income tax policy on income inequality in South Korea, an economy affected by the 1997 Asian financial crisis. They discovered that income tax had a limited redistributive effect due to its low average tax rate, despite its progressive structure. A major issue was the high level of horizontal inequity, where individuals with similar incomes faced unequal tax burdens. This problem was particularly severe in 1996 due to excessive deductions and exemptions. Although income inequality worsened in 2000, horizontal equity improved.

Engel et al. (1999) measured the direct impact of taxes on household income distribution in Chile and analyzed the distributional effects of various changes to the tax system. They discovered that the Gini coefficients for income distribution before and after taxes were very similar. Additionally, significant changes to the tax structure, such as increasing the value-added tax or replacing the progressive income tax with a flat tax, had only a minor impact on the after-tax income distribution. Malla and Pathranarakul (2022) conducted a

comparative analysis and found that income tax is effective in reducing income inequality in developing countries but has a limited impact in developed countries. Additionally, their results indicate that government size, education spending, and healthcare spending are negatively correlated with income inequality only in developed countries. Padhan et al. (2022) found that raising taxes can increase income inequality, while government spending can reduce it over the long term. Claus et al. (2012) analyzed 22 Asian countries from 1970 to 2009, examining the connection between tax policy and income distribution as measured by the Gini coefficient. They concluded that increasing the income tax rate tends to increase income inequality.

There are few empirical studies on the relationship between tax revenues and income distribution in Türkiye. In their multivariate regression analysis, Bükey and Çetin (2017) concluded that tax burden has no effect on income distribution. Demirgil (2018) investigated the effect of direct and indirect taxes on income distribution using data for the period 1980-2014 and ARDL method. As a result of the analysis, it was found that there was a cointegration relationship between the series and that a 1% increase in the indirect tax rate increased the Gini coefficient by 0.10%, while a 1% increase in the direct tax rate decreased the Gini coefficient by 0.05%. Similarly, Günel (2019), who analysed the effect of taxes on income distribution in terms of direct and indirect taxes, obtained similar results. It was also found that indirect and direct taxes are the Granger cause of the Gini coefficient. Akbulut (2021) investigated the effect of interest payments on public domestic debt, inflation, and income tax on income distribution using multivariate regression analysis and found that interest payments and inflation have a distortive effect on income distribution, while income tax has no significant effect. Teyyare and Sayaner (2018), on the other hand, obtained evidence from multivariate regression analysis that taxes have a reducing effect on inequality in income distribution.

Akalın (2021) takes a different approach in terms of indicators and considers income inequality as the difference between Gini-M (Gini market) calculated on market income and Gini-D (Gini disposable) calculated on disposable income. As independent variables, he used the share of income and wealth taxes in GDP, transfer expenditures to avoid omitted variable bias, and unemployment and inflation rates as control variables. According to the results obtained, an increase in income tax, wealth tax, and transfer expenditures decreases income inequality by increasing the difference between Gini-M and Gini-D, and although income tax is more effective than wealth tax in reducing income inequality, the coefficients are quite close to each other. Geyik (2021), on the other hand, used the share of personal income tax in taxation and Gini coefficient variables in his time series analysis for the period 1990-2019. According to the Johansen cointegration test results, there is a long-run relationship between the variables. The coefficient of the long run has a positive sign. Accordingly, the decrease in personal income tax makes income distribution more equitable. The causality test results based on the estimated vector error correction model (VECM) show that there is a unidirectional causality relationship from personal income tax to Gini coefficient.

2. Method, Model, and Data

In the analysis, an approach based on the ARDL model was followed to investigate the effect of income tax on income distribution. The linear ARDL(*p*,*q*) model for a bivariate case (*Y* and *X*) can be written as follows:

$$\Delta Y_t = \mu + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \sum_{j=0}^{q} \delta_j \Delta X_{t-j} + \beta_1 Y_{t-1} + \beta_2 X_{t-1} + \varepsilon_t \quad (1)$$

The null hypothesis of no cointegration can be evaluated using a modified F-test, Wald test, or t-test. If cointegration is established, the long-run relationship between the variables can be estimated using the following equation:

$$Y_t = \eta + \sum_{i=1}^{p} \theta_i Y_{t-i} + \sum_{j=1}^{q} \beta_j X_{t-j} + u_t \quad (2)$$

To assess the short-run relationship between the variables, we can use the following error correction model:

$$\Delta Y_t = \omega + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \sum_{j=1}^{p} \delta_j \Delta X_{t-j} + \varphi ECM_{t-1} + \upsilon_t \quad (3)$$

In some cases, ARDL models may have a very complex lag structure; the model specification may include lags, current values, first differences and lagged first differences of the independent (and sometimes dependent) variable. While it is relatively easy to interpret short-run and long-run effects in a low-lag model such as ARDL(1,1), the more complex the model specification, the more difficult it becomes to capture short-, medium-, and long-run effects.

Jordan and Philips (2018) introduced the dynamic ARDL method, an approach that dynamically simulates various ARDL models to better interpret the results. In this approach, the results from ARDL models are simulated. Furthermore, using stochastic simulation techniques, it is possible to visualize the impact of a counterfactual change in a regressor at a single point in time, *ceteris paribus*. Dynamic simulation approaches are widely used as a simple way to illustrate important results of time series models whose coefficients often have non-intuitive or "hidden" interpretations.

Income inequality is the difference between the share of national income received by a certain proportion of the population and the share of national income received by another proportion of the population (Kubar, 2011). In the economic literature and applied studies, many different criteria have been proposed to measure inequality in income distribution. These include range ratio, McLoone index, coefficient of variation, Gini coefficient, Pareto coefficient, Atkinson inequality measure, and Theil's T statistic. Each of the inequality measures mentioned above is appropriate under certain conditions.

The Gini coefficient developed by the Italian statistician Gini (1921) is widely used in the empirical literature. The Gini coefficient is a comprehensive measure that considers the entire distribution of a population. It's widely recognized as the most common and well-known inequality measure in economic literature. The Gini coefficient allows for direct comparisons between two populations, regardless of their size.

Nevertheless, in this study, the indicator calculated by the University of Texas Inequality Project (UTIP) was preferred to represent income inequality. UTIP uses Theil's T statistic to measure inequality. This choice is not due to inherent flaws in other measures, but because Theil's T has a more adaptable structure that makes it generally more suitable. Complete, individual-level data for the population of interest is often unavailable, forcing researchers to work with aggregated data. This makes Theil's measure more appropriate than the Gini coefficient.

Theil's T statistic is calculated according to the following formula:

$$T = \sum_{p=1}^{n} \left[\left(\frac{1}{n} \right) \times \left(\frac{y_p}{\mu_y} \right) \times ln \left(\frac{y_p}{\mu_y} \right) \right] \quad (4)$$

In this equation, n represents the number of individuals in the population, y_p is the income of the person indexed by p, and μ_y is the average income of the population. If all individuals have exactly the same income, T will be zero, indicating perfect equality, which is the minimum value of Theil's T. Conversely, if one individual possesses all the income, T will be equal to $ln\ n$, representing maximum inequality, which is the maximum value of Theil's T statistic.

If a population can be divided into mutually exclusive and comprehensive groups, Theil's T statistic is composed of two elements: the between-group component (T_g') and the within-group component (T_g^w).

$$T = T_g' + T_g^w \quad (5)$$

If aggregated data is used instead of individual data, T_g' can serve as a lower bound estimate for the population's Theil's T statistic. The between-group component of Theil's T can be written as:

$$T_g' = \sum_{i=1}^{m} \left[\left(\frac{p_i}{P} \right) \times \left(\frac{y_i}{\mu} \right) \times ln \left(\frac{y_i}{\mu} \right) \right] \quad (6)$$

Here, i indexes the groups, p_i is the population of group i, P is the total population, y_i is the average income in group i, and μ is the average income across the entire population. T_g' is bounded above by $ln[P/p_i\ (\min)]$, the natural logarithm of the total population divided by the size of the smallest group. This maximum value occurs when the smallest group possesses all the resources (Galbraith and Hale, 2007).

For the analysis, the sample period covers the period of 44 years between 1972 and 2015. Annual data for public expenditures and income tax were obtained from the website of the General Directorate of Public Accounts, data for inequality measures was obtained from the University of Texas Inequality Project (UTIP), and other data were compiled from the World Bank's World Development Indicators database.

3. Findings

Since most time series exhibit non-stationary behaviour, the standard practice in time series analysis is to first investigate the stationarity properties of the series. For this purpose, ADF (Augmented Dickey-Fuller) and KPSS (Kwiatkowski-Phillips-Schmidt-Shin) unit-root tests were used to investigate the degree of integration of the series. that all series are stationary in their first differences while they are non-stationary at their level values. In this case, a cointegration test was applied in order to avoid spurious results of a regression relationship between the variables. For this purpose, the bounds test based on the ARDL model developed by Pesaran et al. (2001) was used.

Table 1: Results of The ADF and KPSS Unit-Root Tests

	ADF		KPSS	
	c	c + t	c	c + t
IDIST	– 1.3246 0.6107	– 1.0934 0.9196	0.2575	0.1996
GEXP	– 0.9785 0.7536	– 0.2015 0.9912	0.8965	0.1372
GDP	– 0.9273 0.7710	– 0.2623 0.9896	0.8974	0.1342
INF	– 1.7699 0.3906	– 1.7699 0.4353	0.3266	0.1727
TAX	– 1.1057 0.7062	– 0.2271 0.9906	0.8996	0.1339
POP	– 0.8727 0.7866	– 3.1499 0.1091	0.9219	0.2284
ΔIDIST	– 6.2448 < 0.01	– 6.4506 < 0.01	0.1839	0.0840
ΔGEXP	– 5.5087	– 5.5466	0.2884	0.2353

	< 0.01	< 0.01		
ΔGDP	– 5.0248 < 0.01	– 5.0431 < 0.01	0.2651	0.2203
ΔINF	– 7.3474 < 0.01	– 7.3942 < 0.01	0.1854	0.1018
ΔTAX	– 5.5264 < 0.01	– 5.5675 < 0.01	0.2983	0.2437
ΔPOP	– 2.6385 0.0946	– 2.0139 0.5747	0.7509	0.1655

Notes: For ADF test results the related p-values are given below the test statistics. Critical values for KPSS tests are as follows: for specification with intercept 0.739 (%1), 0.463 (%5), 0.347 (%10); for specification with intercept and trend 0.216 (%1), 0.146 (%5), 0.119 (%10).

The estimation of the ARDL(4,1,2,0,4,4) model selected based on the Akaike information criterion is given in Table 2. According to the bounds test result, there is a significant long-run relationship between the variables. When the coefficient estimates are evaluated, it is observed that most variables except the population either do not affect income distribution or have a weak effect. Although government expenditures increase inequality in income distribution in the current period, this significant effect does not persist and disappears in subsequent periods. The effect of population varies in sign from one period to another. Although the effect in each period is statistically significant, interestingly it is observed that the negative and positive effects in the five periods neutralise each other in sum. Accordingly, it can be said that the effect of population movement on income distribution has disappeared at the end of five periods. Income tax has no effect on income distribution in the current and the following few periods. However, a strong and negative, i.e. income redistributive effect is observed after three lags. This can be taken as a sign that income tax plays a limited role in ensuring justice in income distribution in Türkiye.

Table 2: Estimation of The ARDL (1,3,3,3,1,0) Model and The Result of Bounds Test

Variable	Coefficient	St. error	t-statistics	p-value
Intercept	5.7649	121.5311	0.0474	0.9626
$IDIST_{t-1}$	0.4584	0.1453	3.1541	0.0043
$IDIST_{t-2}$	0.2430	0.1665	1.4594	0.1574
$IDIST_{t-3}$	– 0.2109	0.1673	– 1.2599	0.2198
$IDIST_{t-4}$	– 0.2862	0.1554	– 1.8418	0.0780

GDP_t	– 0.9766	3.4419	– 0.2837	0.7790
GDP_{t-1}	– 5.5508	3.2123	– 1.7280	0.0968
$GEXP_t$	5.9904	2.6716	2.2422	0.0345
$GEXP_{t-1}$	– 1.3322	3.3139	– 0.4020	0.6912
$GEXP_{t-2}$	4.8400	2.9216	1.6566	0.1106
INF_t	0.0152	0.0101	1.5084	0.1445
POP_t	6070.08	1583.812	3.8325	0.0008
POP_{t-1}	– 21458.02	5649.756	– 3.7980	0.0009
POP_{t-2}	28312.65	8380.817	3.3782	0.0025
POP_{t-3}	– 16718.09	6153.882	– 2.7166	0.0120
POP_{t-4}	3797.847	1869.386	2.0316	0.0534
TAX_t	– 3.2520	3.3478	– 0.9713	0.3410
TAX_{t-1}	5.1769	3.7215	1.3910	0.1770
TAX_{t-2}	– 2.9310	2.9553	– 0.9917	0.3312
TAX_{t-3}	1.5315	0.8774	1.7455	0.0937
TAX_{t-4}	– 3.5965	0.7251	– 4.9600	< 0.01
R^2	0.9590	p-value	DW statistics	2.4801
F statistics	31.6280	0.0000	AIC	– 6.9630
B-G χ^2	2.2666	0.1120	SBC	– 6.2107
B-P-G χ^2	12.2645	0.7839	CUSUM	Stable
J-B	0.9792	0.6129	CUSUM-Sq	Stable
Bounds test statistics		Sig. level	Critical values	
			I(0)	I(1)
F statistics	9.5345	%10	3.012	4.147
		%5	3.532	4.800
		%1	4.715	6.293

According to the coefficient estimates of the long-run relationship, all variables have a statistically significant effect on income distribution (Table 3). The direction of the effect is positive for public expenditures and inflation and negative for other variables. Accordingly, income and population growth have a corrective effect on income

distribution. Again, it is noteworthy that the income tax, which is the focal point of the study, also has a compensating effect on the inequality in income distribution. Contrary to expectations, the increase in public expenditures has an increasing effect on inequality in income distribution. This may be thought to be a consequence of the fact that those who benefit from public expenditures in terms of income are mostly those in the high-income group. However, the fact that the increase in income is significant and has a negative sign indicates that the regulatory effect of the rise in income can partially eliminate the distortive effect arising from public expenditures. As a factor that erodes purchasing power, inflation is expected to lead to an increase in poverty and hence increase the gap between income groups. Although the findings confirm this expectation, they reveal that this negative effect of inflation on income distribution is limited in Türkiye.

Table 3: Estimation of The Long-Run Relationship

Variable	Coefficient	St. error	t-statistics	p-value
GDP	– 0.3218	0.0591	– 5.4454	< 0.01
GEXP	0.4690	0.0757	6.1921	< 0.01
INF	0.0005	0.0002	2.6812	0.0133
POP	– 2.0092	0.5824	– 3.4499	0.0022
TAX	– 0.2056	0.0554	– 3.7082	0.0012

When the estimation values of the short-run model are analysed it is observed that the change in income tax has no immediate significant effect on the change in income distribution (Table 4). Accordingly, while income tax does not lead to any change in income distribution in the short run, it is understood that a negative effect manifests itself over time according to the long-run estimates. It is observed that all other variables have a statistically significant effect in the short run, except for the increase in income, all other effects are negative. The coefficient of the error correction term is negative and significant. Accordingly, the error correction mechanism works rapidly, and short-run imbalances are corrected toward the long-run equilibrium.

Table 4: Estimation of The Error Correction Model

Variable	Coefficient	St. error	t-statistics	p-value
Intercept	13.9074	1.6638	8.3586	< 0.01
Trend	0.0193	0.0024	8.1786	< 0.01
ΔGDP_t	0.0715	0.0217	3.2871	0.0032
ΔGDP_{t-1}	0.2098	0.0414	5.0701	< 0.01
ΔGDP_{t-2}	0.1664	0.0279	5.9725	< 0.01

$\Delta GEXP_t$	0.0439	0.0222	1.9822	0.0595
$\Delta GEXP_{t-1}$	– 0.2542	0.0442	– 5.7494	< 0.01
$\Delta GEXP_{t-2}$	– 0.1839	0.0321	– 5.7396	< 0.01
ΔPOP_t	– 27.6728	3.4116	– 8.1114	< 0.01
ΔINF_t	– 0.0005	0.0001	– 4.5308	< 0.01
ΔINF_{t-1}	– 0.0007	0.0001	– 5.1537	< 0.01
ΔINF_{t-2}	– 0.0005	0.0001	– 3.7431	0.0011
ECT_{t-1}	– 0.8752	0.1048	– 8.3452	< 0.01

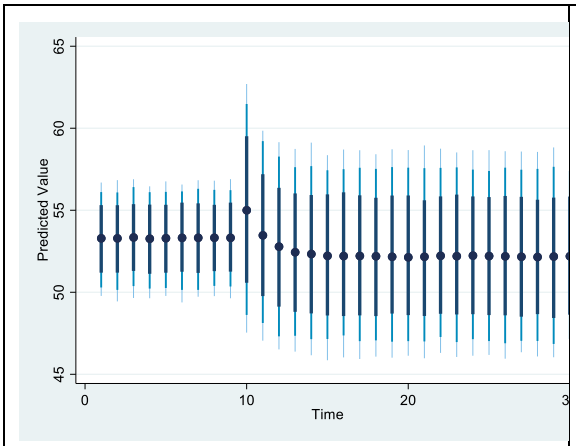
The dynamic ARDL model estimates are presented in Table 5, and the simulation results can be seen in Figure 1. The dynamic simulated ARDL model's unique advantage lies in its ability to accurately forecast the signs and magnitudes of changes in determinants, along with their short-run and long-run connections, while the traditional ARDL approach primarily concentrates on the short-run and long-run relationships between parameters (Abbasi et al., 2021).

Table 5: Estimation of Dynamic ARDL Model

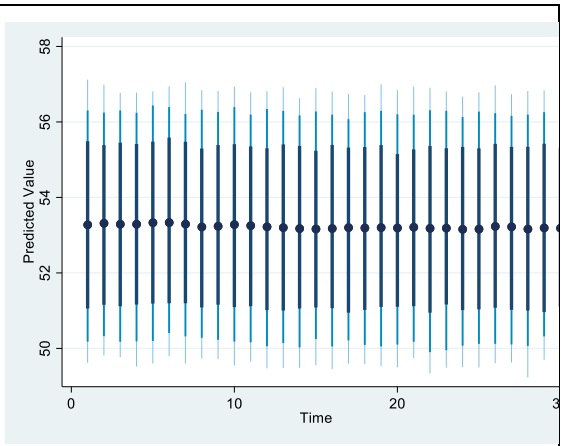
Variable	Coefficient	Std. Error	t-statistics	p-value
Intercept	122.7315	77.7173	1.58	0.123
ΔPOP_t	– 477.1976	205.6668	– 2.32	0.026
POP_{t-1}	– 11.9966	9.9411	– 1.21	0.235
ΔINF_t	0.0157	0.0146	1.07	0.290
INF_{t-1}	0.0307	0.0115	2.67	0.011
ΔTAX_t	– 1.6298	3.8337	– 0.43	0.673
TAX_{t-1}	0.6943	2.8974	0.24	0.812
ΔGDP_t	– 1.8733	3.7664	– 0.50	0.622
GDP_{t-1}	– 6.3683	3.4143	– 1.87	0.070
$\Delta GEXP_t$	3.6784	3.3795	1.09	0.284
$GEXP_{t-1}$	6.0529	3.5205	1.72	0.094
$IDIST_{t-1}$	– 0.5451	0.1334	– 4.09	< 0.01

The dynamic ARDL simulation forecasts illustrate the projected impact of each regressor shift on the explained variable. In this study, a 10% shock to each explanatory variable is simulated to measure its impact on income distribution over the simulation period. The impulse response results are shown in Figure 1a-e. The dots represent the predicted mean values, and the light blue to dark blue bars indicate the 70%, 90%, and 95% confidence intervals. As seen in the graphs, inflation and population changes do not significantly affect income distribution. Especially the short-term positive effect of the population

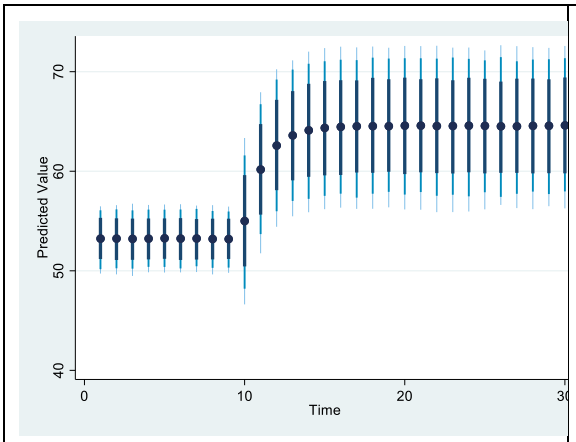
change is remarkable. On the other hand, income (GDP) and public expenditures have larger and more permanent effects on income distribution. While income growth distorts the income distribution by causing the gap between income groups to widen further as a continuation of the existing income distribution, public expenditures show a better redistributive effect. Although the effect of the tax variable, which is the focus of the study, is negative, it seems to be far from ensuring justice in income distribution.



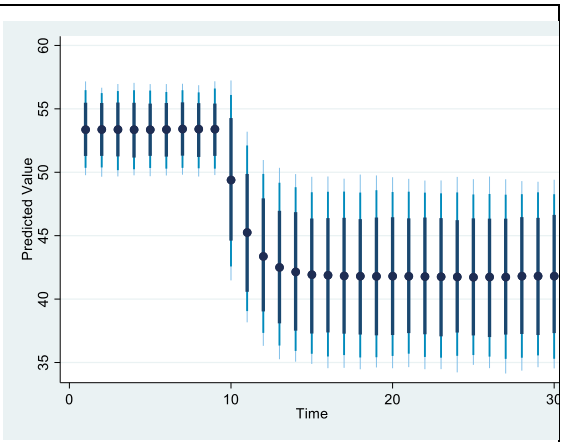
a. TAX



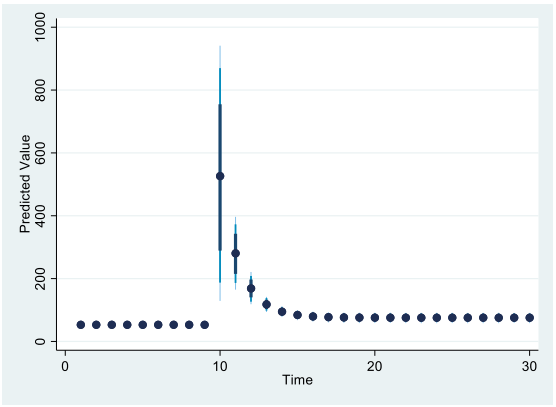
b. INF



c. GDP



d. GEXP



e. POP

Figure 2: Counterfactual Shocks in Predicted Values of The Covariates and Income Distribution Using Dynamic ARDL Simulations

Conclusion

Income distribution remains a hotly debated economic topic in developing countries, and Türkiye is no exception. While poverty has decreased significantly over the past two decades, income inequality has remained relatively unchanged. Many argue that this stagnation is due to ineffective policies that should be replaced with direct measures aimed at redistribution. Given that the tax system is a key tool for influencing income distribution, there is ongoing discussion about the distributional effects of taxes (Engel et al., 1999).

In this study, the regulatory effect of income tax on income distribution in Türkiye has been investigated. According to the findings obtained from time series analysis based on the ARDL approach, although taxes on income in Türkiye have a positive (increasing injustice) effect on income distribution in the short term, it is statistically insignificant in the long term. This result can be interpreted as the fact that income tax does not harm the income distribution in Türkiye, or it can also be attributed to the low-income tax collection and/or the fact that a large part of the total tax revenues consists of indirect taxes collected from consumption.

In terms of international standards, Türkiye is among the countries that cannot collect much tax revenue. According to OECD data, the ratio of total tax revenues to GDP in 2018 is only around 24 percent in our country (the same rate is 46 percent in France and 42 percent in Italy). The share of equivalent total taxes in the equivalent total income of households included in the Household Budget Surveys is 17 percent (Bayar et al., 2021).

On the other hand, governments that have difficulty in collecting taxes on income and wealth, as in Türkiye, use mostly indirect taxes on consumption. Such taxes, which do not take into account individuals' income levels, create a much greater burden on relatively low-income households and support income inequalities in the economy.

Based on the findings, the following policy recommendations can be developed:

- In Türkiye, the share of taxes on consumption, which creates a relatively greater burden on low-income households and leads to a deterioration in income distribution, in total taxes should be reduced and the share of direct taxes should be increased.
- In progressive taxation, tax rates should be regulated in favour of low-income segments and emphasis should be placed on income and wealth taxes.
- The above regulations' ability to serve their purpose depends on effective tax collection. In this respect, it would be appropriate to take the necessary measures to increase collection rates and to stop frequently used tax amnesties from being a policy tool.
- Additionally, it would be beneficial to exempt minimum wage earners, who constitute the most disadvantaged segment in the income distribution and cover a large group, from taxes.

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