How Tax Wedge of Low and Upper-Income Households Affects Income Distribution: Findings from OECD Countries

Article *in* Prague Economic Papers · June 2023

DOI: 10.18267/j.pep.831

1 author:

Emin Efecan Aktaş
Kirsehir Ahi Evran University
37 PUBLICATIONS **29** CITATIONS

Prague Economic Papers
2023, Volume 32, Issue 3
https://doi.org/10.18267/j.pep.831

VŠE / PRAGUE UNIVERSITY OF ECONOMICS AND BUSINESS

How Tax Wedge of Low and Upper-income Households Affects Income Distribution: Findings from OECD Countries

Emin Efecan Aktaş [a]

a Department of Accounting and Tax Practices, Kirsehir Ahi Evran University, Kirsehir, Türkiye
email: emin.aktas@ahievran.edu.tr

Abstract:
The tax wedge mainly quantifies the extent to which tax on labour income enervates employment and it reflects the total labour costs. It is commonly defined as the ratio between the amount of taxes paid by the worker and the related total labour costs for the employer. As such, the tax wedge affects both the labour force (unemployment) by reflecting the burden of the employer and indirectly the household disposable income. It is conferred that the alteration caused by the tax wedge on income distribution has been analysed with a small number of empirical studies. Based on the hypothesis that the tax wedge may affect income distribution from different aspects in terms of household size and income level, dynamic panel data analysis is carried out for 36 OECD member countries and the period 2000–2019. The dynamic panel analysis estimation findings for two households (single person with no children, earning 167% of the average wage, and one-earner married couple with two children, earning 100% of average wages) reveal that the tax wedge is negatively related to unfair income distribution. In addition, the aspect of the relationship is the same (negative) for the two households.

Keywords: Income distribution; tax wedge; labour; generalized method of moments
JEL classification: J21, J82, H24, O15

1. Introduction

Income distribution has been an essential issue in both the economic and political arena. The presence of the state in the economy intensified after the 1929 depression, and fair income distribution is considered part of the responsibility of the state. The state can affect income distribution following various economic policies. However, even in developed economies, the existence of fair income distribution discourse cannot be found. As fair income distribution

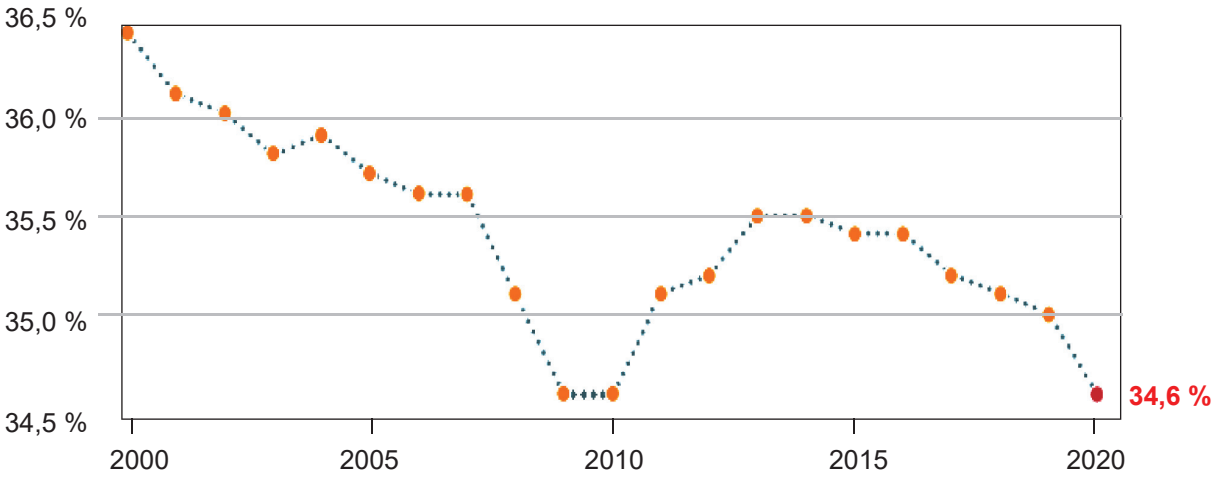
is shaped in line with political preferences, it is one of the controversial and complex objectives of fiscal policy. With a fair income distribution, it is aspired to switch the composition of income and wealth for balancing the income more and depressing inequalities. The distributional effects of tax policies are preferred more by transferring the income from high-income to low-income groups. Income distribution has two aspects: these are primary and secondary income distribution (redistribution of income/wealth). In a market-based economic system, the primary income distribution and wealth are realized through the market. Economic policy should ensure the redistribution of income using methods related to the economic process when the primary income distribution is detected to be insufficient, and its readjustment is demanded. Secondary or redistribution purposes of income and wealth are determined largely depending on the layout of the economy. It is assumed that income distribution is unfair without any government intervention. Since the degree of possession of the production factors and the demand for these factors are heterogenous, leaving the market alone can disrupt income distribution. Therefore, the government must interfere with the economy through taxes.

Taxes and contributions affect labour costs, but the main determinant is gross salary. In another respect, the tax wedge may become more of an issue for an employee because it contains the legal cut from gross salaries. The increase in wage taxes and similar legal obligations enhances the labour costs. The reductions and the financial aids applied by the state in favour of the employees are the basic tools that reduce the labour costs. The state also realizes these reductions and aids to ensure fair income distribution. While the increase in labour costs in a country decreases the labour demand of the employer, it is accepted as a factor that increases unemployment in the country. The tax wedge rates of countries are included in reports published by the Organization for Economic Cooperation and Development (OECD) in detail and are accepted as a determining factor of unemployment. Besides, there are significant definitions of the tax wedge in the literature. It is necessary to refer to these definitions for a better understanding of the concept. The "tax wedge" is the ratio of income tax and social security premiums to the total labour costs of the employee, and the insurance premium and taxes that the employer must pay on the payroll (Hodge and Hickman, 2018, p. 2). The "tax wedge" is the sum of employee social security contributions, personal income taxes, and employer social security contributions net of family allowances expressed as a percentage of total labour costs (the sum of social security contributions paid by the employer and the gross wage) (Kalyva et al., 2018, p. 45). In other words, the "tax wedge" expresses the percentage of the difference between the labour costs (including public burdens) and the net wages received by the labour force (including cash supports) in the total labour costs (Edizdoğan et al., 2013, p. 224). With the increase in tax rates, the gap between the wage paid by the employer and the amount received by the employee unfurls. As the tax wedge heightens, the labour costs for the employer increases, and the labour demand declines. This causes unemployment. In addition, as the income received by the employee decreases, there may be a loss of wealth;

unfair income distribution may increase. The increase in tax rates can be a reason that pushes employees into the grey economy (Daveri and Tabellini, 2000; Calderón and Chong, 2009; Trpeski and Tashevska, 2012; Francese and Mulas-Granados, 2015).

Changes in the tax wedge affect employment through labour supply as well as labour demand. Since increases or decreases in income taxes and social security premiums of employees (tax wedge) will affect the return on employment, decisions of individuals such as whether to enter the labour market, leisure time and working hours can be varied. The decision of employees and employers between these alternatives indirectly affects the income of the workers in the last instance. As such, OECD reports that the labour tax wedge for a single worker earning 100% of the average wage in member countries has dropped from 36.4% to 34.6% from 2000 to 2020 (Figure 1). For this reason, it can be referred that the disposable income of individuals is indirectly affected by the alteration of the income taxation policies of the state (Clark and Cavanagh, 1996; Ederveen and Thissen, 2004; Behar, 2009; Daudey and García-Peñalosa, 2007; Günel, 2020). In this respect, the tax wedge has two different effects on the amount of labour supply, namely income and substitution (Daudey and García-Peñalosa, 2007; Attinasi et al., 2016; Todorović et al., 2018). Due to the income effect, the high tax wedge may reduce the disposable income of employees, so the demand for leisure time will decrease and the amount of labour supply will increase. According to the substitution effect, as the high tax wedge will lead to a lower return on work, the amount of labour supply will decrease with the work incentive. Therefore, it has been stated that the theoretical effect of the tax wedge on the amount of labour supply is uncertain (Jacobson and Occhino, 2012; Francese and Mulas-Granados, 2015; Attinasi et al., 2016; Erauskin, 2020). However, the income of individuals decreases in economic terms in both cases. In addition, it has been emphasized in the literature that the substitution effect is higher than the income effect, so the increase in the tax wedge decreases the amount of labour supply. Accordingly, increases in the tax wedge cause individuals to operate mostly in informal sectors or household activities. This situation makes it difficult to justify the source of the income effect and the nexus between tax wedge and income distribution (Ederveen and Thissen, 2004; Behar, 2009; Karabarbounis et al., 2014; Blundell et al., 2018; Yılancı et al., 2019). Therefore, the significance of the study is to test this nexus and clarify the empirical results.

Figure 1: Average tax wedge progress for an OECD worker (single person, earning 100% of full average wage with no children)



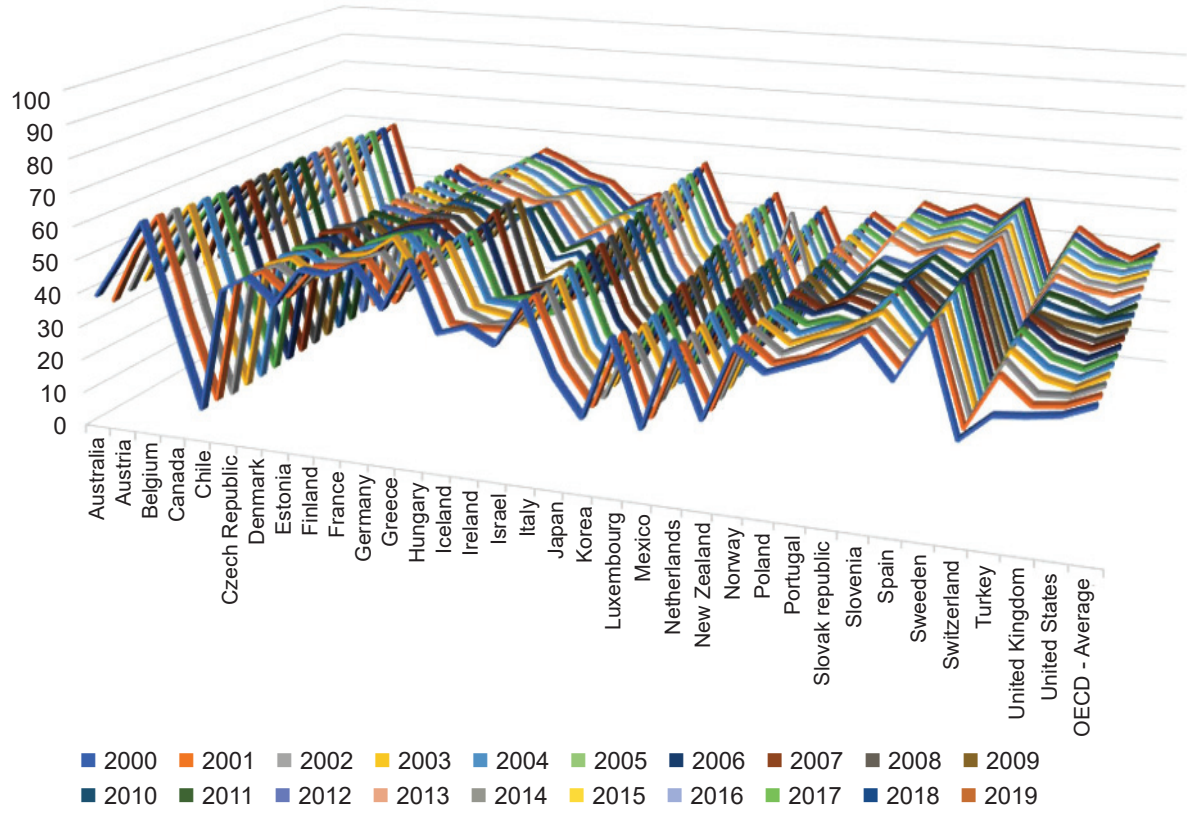
Source: OECD Taxing Wages (2021b)

The high taxes and premiums received by the state result in less wages for the worker. The wages received by the workers are also related to issues such as the national income per capita in a country, and whether the minimum wage is subject to tax or not. These issues are also related to the tax burden and tax wedge on the labour force. It can be said that the weight of the tax wedge in developed countries has emerged as a reflection of the social state understanding of the countries, as a requirement of higher-quality service provision. On the other hand, the increase in the tax wedge in developing countries can be expressed as a transfer or constraint of social security deficits from the past generation to the next. A high tax wedge does not simply reflect the employer‘s labour costs but also denotes legal obligations such as a tax on the employee‘s gross wage. These taxes or deductions can reduce the worker‘s disposable income, albeit indirectly. For these reasons, the research questions in the study can be defined as follows: can a significant relationship be detected between the tax wedge and income distribution? If there is a significant relationship, what is the direction of this relationship (negative or positive)? Is the direction of the relationship the same or different from previous empirical literature? If the income level and household size differ, will the direction of the relationship be the same or not?

The worldwide spread of income inequalities has triggered a debate on the need for more active use of taxes for redistribution and has led to the emergence of new literature in recent years. When the relevant literature is reviewed, there are few studies or research directly analysing the effect of the tax wedge on income distribution. In the literature, the relationship between taxes (tax subjects) and/or tax progressivity and income distribution is researched

generally; taxes are classified according to various criteria and their efficiency is compared. As far as has been quested, this paper is one of the few studies to analyse the nexus between the tax wedge and income distribution directly, and the study is supposed to contribute to the literature. Previous empirical literature generally indicates a negative nexus between the tax wedge and income distribution. The OECD (2021a) calculates the tax wedge rate for 8 different types of households, single and married, with and without children, earning 67%, 100% and 167% of the average wage. Since the tax wedge rate has been calculated by the OECD since 2000, the dynamic panel dataset also starts in that year. The graphs of the tax wedge rate trend for the two households in OECD countries that are the subject of the empirical analysis are shared in Figure 2 and Figure 3. The rates on the left axis of both graphs represent the average tax wedge as a percentage of labour costs.

Figure 2: Tax wedge ratios for a single person, earning 167% of average wage with no children (2000–2019)

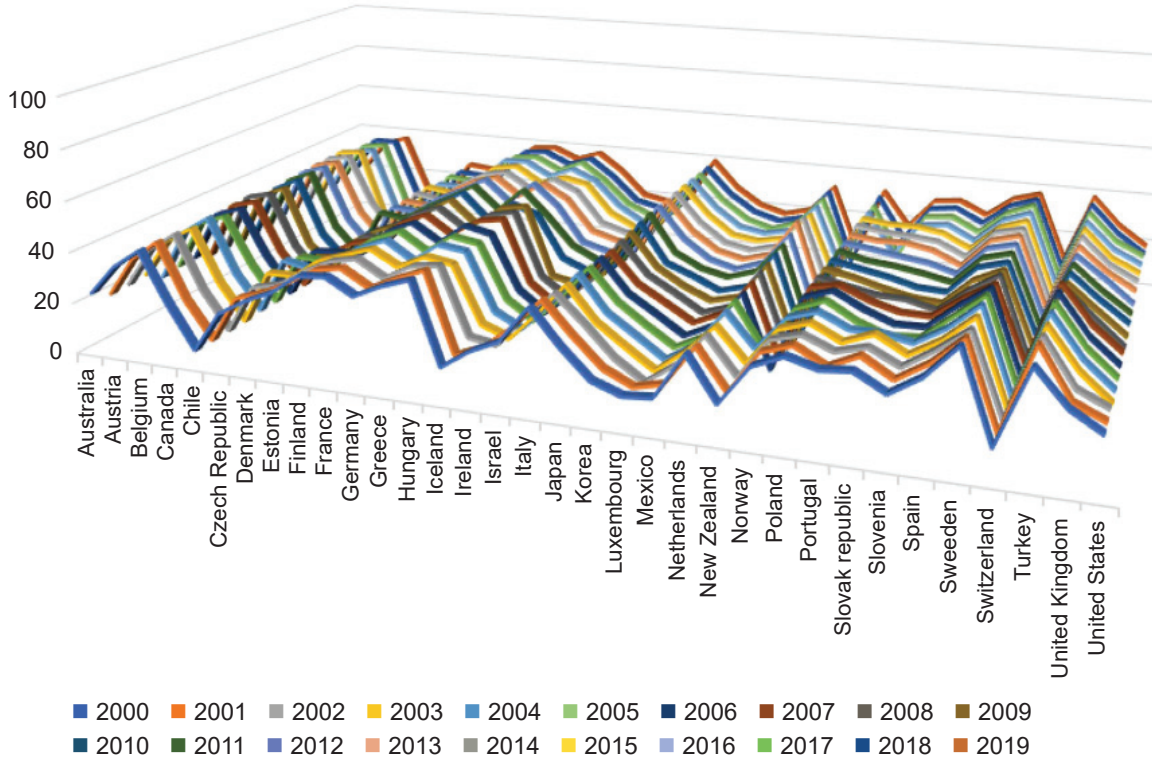


Source: Edited using OECD (2021a) tax wedge statistics.

The (disposable) income level, spending, consumption and saving propensity of these two households are not close to each other. Thus, the first hypothesis tested in the analysis is to determine whether the tax wedge affects income distribution (negatively or positively). The second hypothesis is to determine whether the direction of this effect changes according to household size and income level. The average wage is taken as a basis for determining

the income level of the OECD. A deduction from an income above, below or at the average wage level may not have the same effect on income distribution. In addition, a large part of the income is allocated for household expenditures such as housing costs (rent, mortgage), grocery expenses, education expenditures, social and cultural expenditures, etc. All these expenditures influence household disposable income or propensity to save/spend/consume. The number of household members can enhance the (relative) decline in household income. An income tax may also affect income distribution.

Figure 3: Tax wedge ratios for a married couple with two children, one earner, earning 100% of average wages (2000–2019)

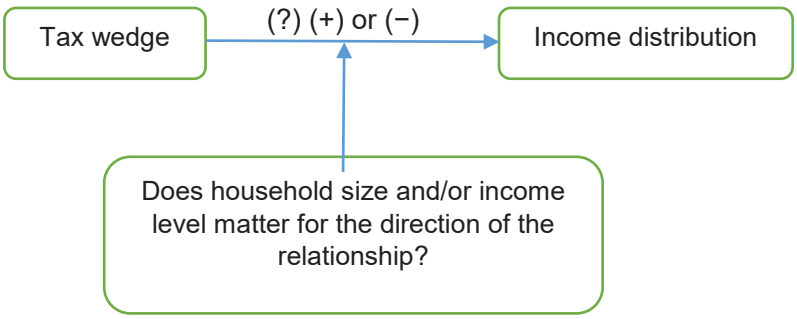


Source: Edited using OECD (2021a) tax wedge statistics.

It is observed that the tax wedge for a single person with no children is higher in OECD countries, and the tax wedge is lower for married couples with children (OECD, 2021b). The other six household indicators converge. In this respect, the tax wedge indicators of the highest and lowest average income per capita are used in the analysis. The first tax wedge indicator (tw) represents a single household with no children earning 167% of the average wage. The second one (1tw) demonstrates a married couple household with two children earning 100% of the average wage (one earner). Tax wedge indicators representing single-person and four-person households enable a comparison of the household size and the income

distribution effects[1]. Accordingly, the research hypothesis of the study is shown in Figure 4. The findings of studies such as de Groot et al. (2004), Checchi and Garcia-Penalosa (2005), Burniaux et al. (2006), Checchi and Garcia-Penalosa (2010), Rossvoll and Sparrman (2015), Akgün et al. (2017), Iosifidi and Mylonidis (2017) on OECD countries are similar to the findings of this study. In the aforesaid studies, the tax wedge has been addressed as the explanatory independent variable based on unemployment and labour costs. In the present study, the tax wedge is included as the main independent variable on the distribution effects, and it diverges from previous studies. In addition, it is presumed that the research contributes to the literature, based on the hypothesis designating the aspect of the tax wedge impact on income distribution in terms of household size and income level differs.

Figure 4: Research hypothesis



Source: Own edited

Based on these explanations, the study examines the effect of the tax wedge for two households on income distribution using dynamic panel data analysis for 36 OECD member countries and the period 2000–2019. Due to the missing data for some countries and years, a balanced panel could not be formed in the empirical estimates; therefore, a dynamic panel data analysis is operated. Detailed knowledge is included in the following sections.

1 For robustness check, the other six tax wedge indicators of households have also been operated in the analysis. Findings are shown in the Appendix. These households are as follows: (2tw): single person at 67% of average earnings, with no children. (3tw): single person at 100% of average earnings, with no children. (4tw): single person at 167% of average earnings, with two children. (5tw): two-earner married couple, one at 100% of average earnings and the other at 67%, with two children. (6tw): two-earner married couple, one at 100% of average earnings and the other at 100%, with two children. (7tw): two-earner married couple, one at 100% of average earnings and the other at 67%, with no children.

2. Literature Review

There is relatively new and growing literature examining the effect of tax composition on macroeconomic variables such as income distribution. Taxation on income or labour in the literature is commonly analysed with income distribution by means of tax progressivity, optimal taxation, and tax policy. Blakey (1938) and Vickrey (1947) have situated the income distribution effects in terms of changes in the tax system. The other earlier analyses such as Dalton (1954), Musgrave (1959) and Atkinson (1970), and later studies such as Auerbach and Feenberg (2000), Madrick and Papanikolaou (2010) and Elwell et al. (2020) have stressed tax progressivity and its effect on income distribution. Suits (1977), Kakwani (1977), Atkinson (1980), Lambert (2001) and Ochmann and Peichl (2006) have improved Atkinson's (1970) study and proved that income distribution may recover under optimal taxation. Taxes on labour are not only related to progressive taxation, tax policy and optimal taxation. The tax wedge concept is more related to labour costs and unemployment. For this reason, empirical testing of the relationship between the tax wedge and income distribution is essential to demonstrate the efficiency of legal cuts over the labour force in effecting distribution. Vanhoudt (1997) tested the nexus between unemployment policies and economic fundamentals on distribution for several countries. The study covered the period 1985–1991 and detected Granger causality between income distribution and the economic fundamentals. The author stated that changes in distribution are related to the changes in tax wedge. Tax wedge reductions can result in lower unfair income distribution through reduced unemployment (Vanhoudt, 1997). De Groot et al. (2004) analysed the economic performance and the labour market policies of 18 OECD countries with 5-year average data and the ordinary least squares estimation for the period 1960–1995. The Gini coefficient was defined as gross household income inequality. The impact of the tax wedge on income distribution was strongly significant. It was conducted that the tax wedge decreases unfair income distribution and increases unemployment (de Groot et al., 2004). Checchi and Garcia-Penalosa (2005) used the ordinary least squares estimation with country and year fixed effects for the period 1970–1996 and 16 OECD countries. It was concluded that the tax wedge, which is an instrument of the welfare state's redistribution policy, has a negative and strong correlation with unfair income distribution while unemployment has a significant positive sign (Checchi and Garcia-Penalosa, 2005). Burniaux et al. (2006) estimated 18 OECD countries for the period 1978–2000 using ordinary least squares and maximum likelihood estimation regression under the assumption of no time and country heterogeneity in the data. One of the explanatory variables was the tax wedge (single-earner couple with two children). The dependent variable of the model was the Gini coefficient. It was noted that the tax wedge appears to decelerate the fair income distribution (Burniaux et al., 2006). Coenen et al. (2007) conducted a simulation analysis for the euro area. The analysis aimed to compare the eurozone tax burden with the level prevailing in the United States. The tax wedge, transfers to households,

and disposable income declined with all tax revenue reductions (Coenen, et al., 2007). Checchi and Garcia-Penalosa (2008) queried the increasing effects of labour market institutions on income distribution. The study contained three concepts of income distribution (factor, total, disposable income) following the ordinary least squares estimation for the sum of 16 Nordic, Anglo-Saxon, and Continental Europe countries. The tax wedge coefficient was negative and highly significant. It was indicated that the unemployment rate, the decile ratio and the Gini coefficient raise due to the higher tax wedge. A 10% rise in the tax wedge enhanced the decile ratio by 5%, the Gini coefficient by 3%, and the unemployment rate by 13% (Checchi and Garcia-Penalosa, 2008).

Checchi and Garcia-Penalosa (2010) tested a panel of OECD countries for the period 1960–2000 using ordinary least squares estimation. According to the findings, the tax wedge has an extensive effect on unfair income distribution, decreasing the Gini coefficient by almost one standard deviation (Checchi and Garcia-Penalosa, 2010). Bachmann et al. (2012) examined the correlation of wage mobility, income distribution and tax wedge with European Union Statistics on Income and Living Conditions data for the period 2004–2010 and 15 EU member states. According to the findings, wage inequality and tax wedge are negatively related. It was stated that wage mobility and wage inequality are low due to the high tax wedge rates and diffusive unemployment benefit systems of Northern and Central European countries (Bachmann, et al., 2012). Catalano and Pezzola (2015) proposed to reduce the labour tax wedge to achieve long-term fiscal consolidation goals and implement structural reforms to accelerate growth in Italy. According to the analysis results, tax wedge cuts lead to a decrease in financial incomes and expenditures. In the absence of structural reform, household public transfers should be reduced at the cost of distorting income distribution to compensate for reductions in the labour tax wedge (Catalano and Pezzola, 2015). Rossvoll and Sparrman (2015) examined the effect of labour market institutions on income distribution for 20 OECD countries and the period 1973–2011 by utilizing generalized least squares and panel data methods. The findings imply that the P90/P10 disposable income decile ratio, the P90/P50 disposable income decile ratio, the P50/P10 disposable income decile ratio, and the tax wedge are negatively correlated (Rossvoll and Sparrman, 2015). Akgün et al. (2017) assessed the impact of changes in the tax structure on the long-term average level of output per capita and disposable income distribution among households for the period 1980–2014 and 34 OECD member countries. Tax wedge decline for the lower half of the income distribution groups may cause lower unfair income distribution and higher disposable income for everyone due to the impact of higher output levels (Akgün et al., 2017). Bükey and Çetin (2017) analysed the tax policy and interest factors that affect income distribution in Turkey between 1980–2014 using the least squares method. According to the results, the tax burden on income does not have any significant effect on income distribution (Bükey and Çetin, 2017). Iosifidi and Mylonidis (2017) used a panel dataset

for analysing the period 1970–2001 and 17 OECD countries. It was confirmed that increasing the tax burden on the labour force could lead to higher unfair income distribution. Labour taxation was found to have a significant negative impact on income distribution. It was also stated that income distribution recovers with an increase in the ratio of labour to consumption taxes. This may be due to the redistribution targets of social security premiums within labour taxes (Iosifidi and Mylonidis, 2017). A similar finding was stated by Ay and Haydanlı (2018) with the table ratio analysis. It was argued that in Turkey, with the effect of globalization after 1980, tax policies have generally been applied in favour of the capital and therefore the tax burden has remained on the labour force through indirect taxes. It was also stated that this situation interrupted the provision of fair income distribution (Ay and Haydanlı, 2018). Urban et al. (2019) analysed the labour tax burden in the period 2011–2017 for Slovakia, Croatia, and Slovenia. The effects of personal income tax and social security contributions on labour tax burden and income distribution were studied using micro-simulation analysis with data from European Union Statistics on Income and Living Conditions. Detailed findings were made on the effects of reforms on income distribution and the average and marginal tax wedge. It was observed that the changes in the personal income tax rates of Slovakia during the period brought about declines in average tax wedge and income distribution (Urban et al., 2019).

3. Salient Features of Data

The data used in the study are listed in Table 1. All the variables are defined annually between 2000–2019 for 36 OECD countries[2] and added to the models in their natural logarithmic form. The Gini coefficient, which is the income distribution indicator, is used as the dependent variable. This variable has been used frequently in empirical studies in recent years and has been compiled from the Standardized Income Inequality Database (Solt, 2020). Income distribution is the comparison of the shares of classes with the highest income and the lowest income from the total income. Some people can consume more than is necessary due to unfair income distribution. It also causes many people to be deprived of the opportunity to meet even their basic needs. The Gini coefficient is used to quantify unfair income distribution. This coefficient ranges between 0 and 1. In the case of a completely fair income distribution, the coefficient is 0, and in the case of a completely unfair income distribution, the coefficient is 1. Occasions in which the Gini coefficient approaches 1 imply an unfair income distribution. The analysis utilizes gini_disp[3], which is an indicator of (unfair) income distribution after taxes and transfers, equalized

2 Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea Republic, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

3 Please note that the income distribution indicator has some missing values (gini_disp indices of some countries for 2018 and 2019).

with household disposable income. In realizing the study hypothesis, two tax wedge indicators are utilized. These indicators are subject to the following households: single person without children and earning an income above the average wage (167% of the average wage), and married couple with two children, earning 100% of the average wage (one earner). Thus, it is investigated whether the income level and the household size in terms of tax wedge change the direction of nexus.

Table 1: Data information

Variable	Indicator	Source
Income distribution (*gini_disp*)	Income inequality after taxes and transfers, equalized with household disposable income.	Standardized World Income Inequality Database (SWIID)
Tax wedge (*tw*/1*tw*)	Labour tax wedge (% of labour costs): the ratio between the amount of taxes paid by a single worker (167% of the average wage) without children and the corresponding total labour costs for the employer.	OECD Database
	Labour tax wedge (% of labour costs): the ratio between the amount of taxes paid by a one-earner married couple (earning 100% of the average wage) with two children and the corresponding total labour costs for the employer.	
Inflation (*inf*)	Consumer price index (2010=100): changes in the costs to the average consumer of obtaining a basket of goods and services.	World Bank Databank
Investment (*inv*)	Gross fixed capital formation (annual % growth)	World Bank Databank
Unemployment (*une*)	Unemployment, total (% of the labour force, modelled ILO estimation)	World Bank Databank
Foreign trade (*tra*)	Sum of exports and imports of goods and services, measured as a share of GDP.	World Bank Databank
Economic growth (*gdp*)	Real gross domestic product at constant 2017 national prices (in mil. 2017 US$)	Penn World Table 9.0

Source: Own edited

The tax wedge (tw, 1tw) variables have been obtained from the OECD database. The OECD has been calculating the tax wedge and sharing the data with the public since 2000 (OECD, 2021a).. Combined control variables are also operated in the analysis in line with the previous literature[4] and in order not to cause neglected variable deviations. These are:

4 The previous literature of the effect of control variables on income distribution is referred to in the Findings and Discussion section.

unemployment (une), investment (inv), economic growth (gdp), foreign trade (tra) and inflation (inf). A summary and descriptive knowledge of the data are included in Table 1.

Table 2: Descriptive statistics

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
gini_disp	684	75.108	44.735	22.6	50.8
tw*/1*tw	720/720	36.415/37.094	10.639/14.108	7/7	57.103/54.720
inf	720	97.880	16.341	20.594	234.437
inv	720	3.011	9.482	−47.91	94.19
une	720	7.544	4.103	1.81	27.47
tra	720	95.315	57.128	19.798	408.362
gdp	720	41,638.48	27,802.01	7284,73	126,591

Source: author's calculations

As can be seen from Table 2, independent and control variables differ significantly across panel countries. The economic development levels of the OECD countries subject to the panel are different. However, as can be seen from the table, the difference between the standard deviations and average values of the observations is negligible.

4. Research Methodology

Panel data regressions have some advantages owing to the data quality, using cross-sectional analysis and time series together. Panel regressions are created with the help of static and dynamic models. In dynamic models, the fact that the lagged value of the dependent variable is included in the model as an independent variable leads to an endogeneity problem. For this reason, known estimators cannot be used to estimate these models (Bond, 2002; Verbeek, 2017; Akay, 2018). For the estimation of the dynamic model, the (difference) generalized method of moments estimator developed by Arellano and Bond (1991) and the system generalized method of moments estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998) are generally used in the literature. The system generalized method of moments is focused on incorporating the difference equation and the level equations; as opposed to the first difference method, the difference from the prior period is not accounted for in the current pe-

riod. Rather, the difference between the average of all potential future values of a variable is measured. Thereby, if the variables are undergoing a random walk, the system GMM can deliver more precise estimates (Breitung, 1997; Bond, 2002; Sattarhoff, 2010; Akay, 2018). In addition, the system GMM estimator is more accurate and more effective in finite population sampling in small samples (Hayakawa, 2007; Soto, 2009; Roodman, 2009). The effect of the labour tax wedge on income distribution is analysed with the system generalized method of moments. A dynamic model can enucleate the income distribution effects in decent quality because it utilizes the lagged values of the dependent variable as independent variables. The dynamic model used in the study is shown below (Hsiao, 2003). Since the assumption that the variables are stationary in the GMM estimator is valid (Jung and Kwon, 2007), the stationarity analysis of the variables in the panel dataset is performed before the model estimation. In order not to take up much space in the study, it is deemed sufficient to share brief knowledge about the stationarity analysis and dynamic panel data analysis. For more detailed information, see Arellano and Bond (1991), Arellano and Bover (1995), Blundell and Bond (1998), Breitung (2000), Choi (2001), Levin et al. (2002), or Im et al. (2003).

$$y_{it} = y_{i,t-1} + \beta_1 x_{it} + \eta_i + \lambda_i + \varepsilon_{it} \qquad i = 1, 2, \ldots\ldots\ldots, \mathrm{N} \text{ and } t = 1, 2, \ldots\ldots\ldots, \mathrm{T} \tag{1}$$

Where x_{it} represents the independent variable vector of the size $k \times 1$; $y_{i,t-1}$ is the lagged value of the dependent variable and takes place in the model as an independent variable; β_1 is the coefficient matrix of the size $k \times 1$; $y_{i,t-1}$ is the lag value of the dependent variable. The unobservable individual effects are denoted by y_{it} and η_i . The unobservable time-specific impacts are designated by λ_i; and ε_{it} is the error term that represents the effect of the unobservable factors that varies across cross-sections and over time. The models established from Equation (1) are as follows:

$$\ln gini\_disp_{it} = \beta_0 + \beta_1 \ln gini\_disp_{it-1} + \beta_2 \ln tw_{i,t} + \beta_3 \ln une_{i,t} + \beta_4 \ln tra_{i,t} + \tag{2}$$
$$+ \beta_5 \ln \inf_{i,t} + \beta_6 \ln inv_{i,t} + \beta_7 \ln gdp_{i,t} + {}_i + \lambda_i + \varepsilon_{it}$$

$$\ln gini\_disp_{it} = \beta_0 + \beta_1 \ln gini\_disp_{it-1} + \beta_2 \ln 1tw_{i,t} + \beta_3 \ln une_{i,t} + \beta_4 \ln tra_{i,t} + \tag{3}$$
$$+ \beta_5 \ln infi,t + \beta_6 \ln inv_{i,t} + \beta_7 \ln gdp_{i,t} + {}_i + \lambda_i + \varepsilon_{it}$$

5. Findings and Discussion

The stationary properties of the variables are observed by Levin, Lin and Chu (LLC) (2002), Breitung's (2000) Fisher ADF, Im, Pesaran and Shin (IPS) (2003), and Choi's (2001) Fisher PP unit root tests. Table 3 presents the panel unit root test results.

Table 3: Panel unit root test results

Variables	Model	Fisher PP Chi-square	Im, Pesaran and Shin (IPS)	Fisher ADF Chi-square	Levin, Lin and Chu (LLC)
gini_disp	constant	67.23 (0.011)	–2.34 (0.569)	89.21 (0.000)	–1.34 (0.003)
	constant and trend	45.32 (0.231)	–3.57 (0.108)	115.63 (0.004)	–1.76 (0.000)
	non	64.89 (0.467)		57.36 (0.000)	–2.46 (0.000)
tax wedge (tw)	constant	67.43 (0.234)	–0.21 (0.102)	58.26 (0.034)	–1.28 (0.000)
	constant and trend	43.45 (0.346)	–2.56 (0.000)	75.41 (0.115)	–1.51 (0.008)
	non	54.28 (0.078)		64.57 (0.097)	–3.31 (0.004)
tax wedge (1tw)	constant	57.28 (0.174)	–3.43 (0.105)	28.57 (0.008)	–4.52 (0.000)
	constant and trend	43.38 (0.482)	–9.04 (0.592)	53.47 (0.000)	–4.85 (0.004)
	non	53.93 (0.089)		51.28 (0.104)	–4.68 (0.012)
une	constant	47.84 (0.534)	–2.67 (0.002)	129.89 (0.000)	–3.12 (0.000)
	constant and trend	32.61 (0.238)	–3.21 (0.043)	86.31 (0.000)	–3.24 (0.012)
	non	65.38 (0.137)		78.21 (0.001)	–3.46 (0.000)
tra	constant	62.73 (0.104)	–4.76 (0.001)	94.57 (0.000)	–3.84 (0.000)
	constant and trend	54.72 (0.098)	–5.32 (0.000)	77.42 (0.000)	–3.47 (0.020)
	non	71.95 (0.213)		86.20 (0.000)	–4.51 (0.000)
inf	constant	429.58 (0.014)	–26.58 (0.081)	137.28 (0.000)	–7.43 (0.039)
	constant and trend	238.75 (0.003)	–23.37 (0.010)	103.46 (0.000)	–11.45 (0.000)
	non	128.09 (0.002)		294.57 (0.000)	–8.11 (0.000)
inv	constant	43.67 (0.002)	–2.74 (0.000)	45.01 (0.034)	–2.23(0.045)
	constant and trend	85.34(0.321)	–1.23 (0.096)	102.34 (0.001)	–4.59 (0.000)
	non	12.81 (0.047)		34.32 (0.543)	–4.57 (0.034)
gdp	constant	391.58 (0.000)	–12.56 (0.012)	284.09 (0.004)	–37.05 (0.027)
	constant and trend	178.27 (0.000)	–5.92 (0.006)	217.81 (0.000)	–9.27 (0.047)
	non	347.54 (0.000)		162.69 (0.000)	–16.49 (0.018)

Note: Values in brackets present probability values. The p values for the Fisher tests are calculated using the asymptotic chi-square distribution. All other tests are calculated under the assumption of asymptotic normality. According to the Akaike information criterion, the optimal lag length is detected as (1). "non" means no constant and trend.

Source: author's calculations

Table 3 reveals dissimilar results for the stationarity characteristics of the variables of unit root tests. According to Fisher ADF, Levin, Lin and Chu and Fisher PP test results, all the variables are stationary except gini_disp. According to the Fisher PP findings, the variables are not stationary except inflation and economic growth. It is commonly stated in the literature that various panel unit root tests share atypical findings. In such cases, researchers mostly consider to which aspect the majority of test statistics point. Since each variable is stationary according to at least one test result, the variables are stationary.

Table 4: Dynamic panel data analysis results

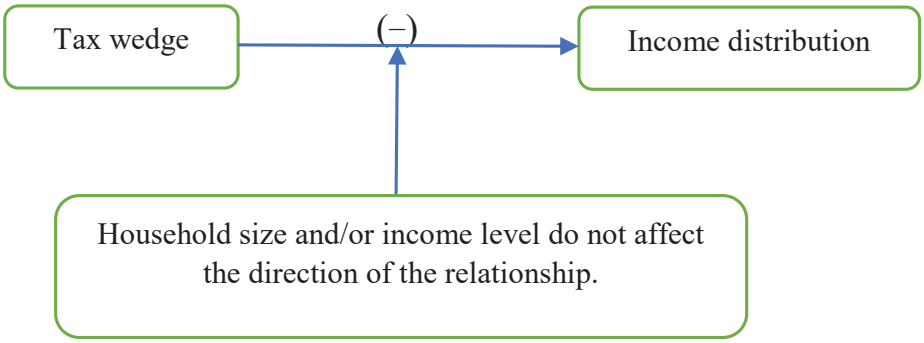
Variables	System GMM model 1		Variables	System GMM model 2	
	Dependent var.: ln*gini_disp*			Dependent var.: ln*gini_disp*	
	coef. (sta. err.)	*p* values		coef. (sta. err.)	*p* values
***gini_disp*(–1)**	0.742850 (0.0043)	(0.000)	***gini_disp*(–1)**	0.729401 (0.0047)	(0.000)
***tax wedge* (ln*tw*)**	–0.050295 (0.0005)	(0.000)	***tax wedge* (ln*tw*)**	–0.040362 (0.0012)	(0.000)
ln*une*	0.004946 (0.0001)	(0.000)	**ln*une***	0.005834 (0.0003)	(0.000)
ln*tra*	–0.011472 (0.0002)	(0.000)	**ln*tra***	–0.001037 (0.0000)	(0.000)
ln*inf*	0.000032 (0.0000)	(0.000)	**ln*inf***	0.000847 (0.0175)	(0.000)
ln*inv*	0.000076 (0.0000)	(0.000)	**ln*inv***	0.000174 (0.0000)	(0.000)
ln*gdp*	0.005439 (0.0365)	(0.000)	**ln*gdp***	0.005382 (0.0079)	(0.000)
Observations	684			684	
Diagnostic tests					
Sargan	30.591 (0.2749)			25.394 (0.3104)	
AR(2)	–2.163 (0.0284)			–3.284 (0.0105)	

Note: Two-step GMM estimator results are shown. gini_disp(–1) is considered a lag variable.

Source: author's calculations

The results of the diagnostic tests performed for the confidence of the forecasts are given in Table 4. Under the null hypothesis of no autocorrelation, the Arellano-Bond autocorrelation AR(2) test finds no second-order autocorrelation in the first-differenced residuals. The null hypothesis (the validity of over-identifying restrictions) is not valid according to the Sargan test. The coefficients of the variables are strongly significant according to both test results. The system GMM results indicate that the tax wedges (tw and 1tw) are negatively correlated with the income distribution. Checchi and Garcia-Penalosa (2005), Checchi and Garcia-Penalosa (2008), Bachmann et al. (2012), Burniaux et al. (2006), Checchi and Garcia-Penalosa (2010) and Rossvoll and Sparrman (2015) have determined that income distribution and tax wedge are negatively correlated, or the tax wedge slackens the unfair income distribution. The research hypothesis can be illustrated as follows according to the results.

Figure 5: Results of related hypothesis



Source: Own edited

The findings reveal that as the tax wedge rises, unfair income distribution tapers off. In addition, it is determined that the household size and income level do not reverse the direction of the relationship. The robustness check of the other six tax wedge indicators demonstrates the same direction regarding the relationship[5]. Although the inverse relationship between the variables is similar to the previous literature, some issues need to be addressed to sense the income distribution effects of the tax wedge. The tax wedge is a relative measure of the tax burden that a government imposes on labour. In countries where there is a large gap between labour costs and net wages (a high tax wedge and high unemployment), some fiscal precautions must be taken for labour costs. When a country lowers its tax wedge by reducing taxes or social insurance premiums, there would be a rise in employment and a decline in unemployment rates, depending on the decrease in labour costs. The opposite initiative would inevitably result in lower employment and higher unemployment, as increasing tax and social insurance

5 See Tables A1, A2 and A3 in the Appendix.

premiums would reduce the labour demand. Most of the empirical studies on OECD and other samples investigate the effects of the tax wedge on employment and do not focus on the income distribution effects. Taxation capacity and tax revenues are not the same in OECD countries. High unemployment in some countries requires reducing the tax burden on labour income. However, the dilemma between the income generation requirement and the high tax wedge may lead decision-makers to new fiscal needs. Considering that the income generation capacity of each country is not the same, it is momentous that the tax wedge is effectively characterized. For example, a decrease in the disposable income of an employee owing to the tax wedge can be compensated through redistribution such as the minimum subsistence allowance. The fact that the tax wedge-income distribution is inversely related for two households puts forward that the tax wedge costs should be paid sufficient attention for interpreting the findings due to the heterogeneity of OECD members. In other words, the insurance premium paid by the employer in any OECD country may be higher than the social security premium paid by the employee. The employee‘s participation in tax wedge costs may be higher in another country. OECD countries do not have a homogeneous tax wedge structure. The attendance of employees and employers in tax wedge costs may shift the direction of the relationship from country to country. As evaluated in the introduction, the income and substitution effects of the tax wedge cause a reduction in the labour supply. The fact that the employees continue to work in the informal sector and household activities, and the difficulty in determining the negative effects of the tax wedge on the labour supply beclouds identification of the income distribution effects of the tax wedge.

Investment and trade variables are positively and negatively related to gini_disp, respectively. Galor and Zeira (1993) tested the nexus between investment and income distribution in a static panel and found a positive correlation (Galor and Zeira, 1993). Carrera and de la Vega (2018) indicated that a high initial level of income is positively associated with investment (Carrera and de la Vega, 2018). The trading volume, which will increase with the formation of gross fixed capital, may also have substantial consequences on the foreign trade balance. An improvement in the trading volume would increase the average product quality, and this can accelerate the demand for a higher-quality labour force. This orientation may harm income distribution through wage inequalities (Verhoogen, 2008). In times of high inflation, there is a transfer of welfare from one segment of society to another (from lenders to borrowers), which distorts the income distribution. It is generally accepted that inflation reduces the purchasing power of low-income groups and may cause unequal income distribution. The effect of unemployment and economic growth variables on income distribution is in line with expectations and compatible with the literature. Empirical research into the relationship between income distribution and economic growth goes back to the 1950s. After Kuznets (1955), many empirical studies have been performed. These studies reveal different findings regarding the relation-

ship between income distribution and economic growth. Using panel data, Li and Zou (1998) and Forbes (2000) have found a positive relationship between income distribution and growth. Many factors, such as the level of the unfair income distribution, periods of depression and expansion of economic growth, and the assumption that different macroeconomic indicators may alter the relationship, affect the growth-distribution nexus. One of the grounds for unfair income distribution is unemployment, which deepens poverty and disrupts income distribution by causing a deterioration of the production and consumption balance and a decrease in investments. The inability of the working-age population to be employed prevents individuals from earning income and causes unfair income distribution. Unemployment rate indicator findings of de Groot et al. (2004), Checchi and Garcia-Penalosa (2005) and Checchi and Garcia-Penalosa (2008) validate the results of the present study.

6. Conclusions

Increasing the labour costs decreases the labour demand of the employer and is considered a factor that increases unemployment. Countries' tax wedge rates are included in the reports published by the OECD in detail, and the tax wedge is accepted as a determining factor of unemployment in international comparisons. Taxes and similar legal obligations on wages are the main factors determining labour costs. While increasing taxes and similar legal obligations raise the labour costs, discounts and fiscal aids applied in favour of employees are the main tools that reduce the labour costs. Another effect of increases and decreases in labour costs is on the income side. Although many factors affect income distribution, the interaction process between the factors also penetrates income distribution. There is a sensitive relationship between the factors affecting income distribution. In this study, the effects of the tax wedge on income distribution and the direction of these effects were determined for 36 OECD countries. The study was realized using dynamic panel data, and various indicators for the period 2000–2019 were also part of the analysis. The relationship of control variables with income distribution is consistent with expectations and the literature. Besides, the impact of the tax wedge on income distribution is also similar to the previous literature under system GMM forecasts.

When the tax wedge is evaluated in terms of employees, a high tax wedge rate determines their disposable income (after the deduction of the government's share), which may create a problem for employees. Although the tax wedge rate has decelerated in OECD countries, three major cuts on labour income still persist. These are income tax, insurance premium payments (employee and employer shares – the tax wedge) and consumption taxes, especially value-added tax. Considering that the tax wedge rate is still around 34% in OECD countries in 2020[6], it emerges that a significant part of employees' income is spent on taxes along with

6 See Figure 1.

consumption expenditures. Considering the negative effects of the tax wedge for both employers and employees, policy changes in countries' tax systems that would reduce these rates are welcomed. However, the income loss caused by the reductions necessitates the generation of new income sources, considering the fiscal requirements in the current period. For this reason, some countries may apply a high tax wedge to engender income.

This study contributes to the literature from the following points of view: Firstly, previous empirical literature has focused on the (un)employment effects of the tax wedge or the progressivity effects of income taxes on income distribution. The present study directly emphasizes the unfair income distribution effects of the tax wedge. Secondly, contrary to the empirical literature, in which the tax wedge is the explanatory independent variable, this paper includes the tax wedge as the basic independent variable. Thirdly, the hypothesis that the direction of the effect of the tax wedge on income distribution may vary according to household size and income level has been tested and it has been attained that the direction of the effect is the same (negative). Finally, the findings are the same as in the previous literature (inverse relationship). Employer and employee participation in tax wedge costs is not the same across OECD countries. It is substantial for policymakers to apply a tax wedge policy mix by considering the effects on unemployment or income distribution (substitution and income effects) and updating the tax structure according to dynamic economic issues.

The first limitation of the analysis is the tax wedge indicator. The OECD baseline scenario is based on single, childless households earning 100% of the average wage (Figure 1). Across OECD countries, a single person has a higher tax wedge, and married couples with children have a lower tax wedge. The other six households are divergent. Though some ratios are convergent, some of the indicators are not. For this reason, the two households with divergent ratios from each other have been preferred in terms of household size and income level. Future studies should repeat the estimates taking this limitation into account. Moreover, future studies may improve the value added of the research area as follows: (i) debating those employers and employees who do not bear the tax wedge costs at the same rate; (ii) reanalysing the hypothesis on different samples; (iii) emphasizing income distribution data limitations; (iv) utilizing other economic inequalities (wage or wealth inequality) for the empirical models; (v) testing threshold regressions as a superior methodology.

Appendix

Table A1: Dynamic panel data analysis results of (2tw) and (3tw) for robustness check

Variables	System GMM Model-1		Variables	System GMM Model-2	
	Dependent Var: ln*gini_disp*			Dependent Var: ln*gini_disp*	
	Coe. (sta. err.)	*P*-Values		Coe. (sta. err.)	*P*-Values
***gini_disp*(–1)**	0.384914 (0.0027)	(0.002)	***gini_disp*(–1)**	0.004529 (0.0102)	(0.011)
***tax wedge* (ln2*tw*)**	–0.004528 (0.0011)	(0.000)	***tax wedge* (ln3*tw*)**	–0.000829 (0.0004)	(0.002)
ln*une*	0.010362 (0.0000)	(0.000)	**ln*une***	0.000353 (0.0006)	(0.000)
ln*tra*	–0.004729 (0.0019)	(0.003)	**ln*tra***	–0.010358 (0.0052)	(0.001)
ln*inf*	0.000378 (0.0004)	(0.001)	**ln*inf***	0.000053 (0.0076)	(0.000)
ln*inv*	0.000481 (0.0082)	(0.000)	**ln*inv***	0.003027 (0.0050)	(0.000)
ln*gdp*	0.006401 (0.1035)	(0.000)	**ln*gdp***	0.000463 (0.0008)	(0.021)
Observations	684			684	
Diagnostic Tests					
Sargan	32.103 (0.3651)			23.048 (0.4103)	
AR(2)	–1.582 (0.3802)			–4.201 (0.0293)	

Note: Two-step GMM estimator results are shown. gini_disp(–1) is considered as a lag variable

Source: author's calculations

Table A2: Dynamic panel data analysis results of (4tw) and (5tw) for robustness check

Variables	System GMM Model-1		Variables	System GMM Model-2	
	Dependent Var: ln*gini_disp*			Dependent Var: ln*gini_disp*	
	Coe. (sta. err.)	*P*-Values		Coe. (sta. err.)	*P*-Values
***gini_disp*(–1)**	0.002901 (0.01839)	(0.001)	***gini_disp*(–1)**	0.003043 (0.0392)	(0.000)
***tax wedge* (ln4*tw*)**	–0.000372 (0.0038)	(0.001)	***tax wedge* (ln5*tw*)**	–0.150482 (0.0294)	(0.000)
ln*une*	0.018457 (0.0004)	(0.000)	**ln*une***	0.029038 (0.0027)	(0.000)
ln*tra*	–0.003281 (0.0026)	(0.002)	**ln*tra***	–0.003892 (0.0016)	(0.000)
ln*inf*	0.000103 (0.0002)	(0.000)	**ln*inf***	0.000562 (0.0045)	(0.000)
ln*inv*	0.009032 (0.0001)	(0.000)	**ln*inv***	0.000174 (0.0000)	(0.000)
ln*gdp*	0.000038 (0.0047)	(0.000)	**ln*gdp***	0.006729 (0.0009)	(0.000)
Observations	684			684	
Diagnostic Tests					
Sargan	29.047 (0.1683)			22.903 (0.2833)	
AR(2)	–3.071 (0.0976)			–3.105 (0.0460)	

Note: Two-step GMM estimator results are shown. gini_disp(–1) is considered as a lag variable

Source: author's calculations

Table A3: Dynamic panel data analysis results of (6tw) and (7tw) for robustness check

Variables	System GMM Model-1		Variables	System GMM Model-2	
	Dependent Var: ln*gini_disp*			Dependent Var: ln*gini_disp*	
	Coe. (sta. err.)	*P*-Values		Coe. (sta. err.)	*P*-Values
***gini_disp*(–1)**	0.009060 (0.0022)	(0.000)	***gini_disp*(–1)**	0.003892 (0.0017)	(0.000)
***tax wedge* (ln6*tw*)**	–0.039230 (0.0008)	(0.000)	***tax wedge* (*ln7tw*)**	–0.068034 (0.0003)	(0.000)
ln*une*	0.000582 (0.0006)	(0.000)	**ln*une***	0.000482 (0.0009)	(0.000)
ln*tra*	–0.000603 (0.0011)	(0.001)	**ln*tra***	–0.002037 (0.0001)	(0.000)
ln*inf*	0.000049 (0.0002)	(0.000)	**ln*inf***	0.000149 (0.0049)	(0.000)
ln*inv*	0.000039 (0.0007)	(0.000)	**ln*inv***	0.000383 (0.0013)	(0.001)
ln*gdp*	0.000404 (0.0003)	(0.000)	**ln*gdp***	0.009402 (0.0066)	(0.000)
Observations	684			684	
Diagnostic Tests					
Sargan	31.106 (0.8403)			23.572 (0.2610)	
AR(2)	–1.904 (0.1048)			–2.407 (0.0386)	

Note: Two-step GMM estimator results are shown. gini_disp(–1) is considered as a lag variable

Source: author's calculations

References

Akay, E. Ç. (2018). Stata ve Panel Modellerinin Tahmini. In S. Güriş (Ed.), Uygulamalı panel veri ekonometrisi (pp. 106–130). İstanbul: Der Yayınları.

Akgün, O., Cournède, B., Fournier, J. M. (2017). The effects of the tax mix on inequality and growth. OECD Economics Department Working Papers (Working Paper No. 1447).

Arellano, M., Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), 277–297. https://doi.org/10.2307/2297968

Arellano, M., Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Atkinson, A. B. (1970). On the measurement of inequality. *Journal of Economic Theory*, 2(3), 244–263. https://doi.org/10.1016/0022-0531(70)90039-6

Atkinson, A. (1980). Horizontal Inequity and the Distribution of the Tax Burden. In H. Aaron and M. Boskin (Ed.), The economics of taxation (pp. 3–18). Washington, DC: Brookings Institution Press.

Attinasi, M. G., Berardini, F., De Stefani, R., Osterloh, S. (2016). The effects of labor income taxes on labor market performance: An empirical analysis. Draft Working Paper.

Auerbach, A. J., Feenberg, D. (2000). The significance of federal taxes as automatic stabilizers. National Bureau of Economic Research (NBER) Working Papers (Working Paper No. 7662).

Ay, H., Haydanlı, M. L., (2018). Kuruluşundan günümüze Türkiye'de vergi yükü ve gelir dağılımının analizi. *Sosyoekonomi*, 26(38), 53–70. https://doi.org/10.17233/sosyoekonomi.2018.04.04

Bachmann, R., Bechara, P., Schaffner, S. (2012). Wage inequality and wage mobility in Europe. Leibniz Information Centre for Economics Ruhr Economic Papers (Paper No. 386).

Behar, A. (2009). Tax wedges, unemployment benefits and labour market outcomes in the new EU members. *Czech Economic Review*, 3(1), 69–92.

Blakey, R. (1938). Personal income taxation. *American Political Science Review*, 32(3), 557–559. https://doi.org/10.2307/1949140

Blundell, R., Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8

Bond, S. (2002). Dynamic panel models: A guide to micro data methods and practice. University College London The Institute for Fiscal Studies Department of Economics, Centre for Microdata Methods and Practice (Working Paper No. CWPO9/02).

Breitung, J. (1997). Testing for unit roots in panel data using a GMM approach. *Statistical Papers*, 38(3), 253–269. https://doi.org/10.1007/BF02925268

Breitung, J. (2000). The Local Power of Some Unit Root Tests for Panel Data. *Advances in Econometrics*, 15(1), 161–177. https://doi.org/10.1016/S0731-9053(00)15006-6

Bükey, A. M., Çetin, B. I. (2017). Türkiye'de gelir dağılımına etki eden faktörlerin en küçük kareler yöntemi ile analizi. *Maliye Araştırmaları Dergisi*, 3(3), 103–117.

Blundell, R., Joyce, R., Keiller, A. N., Ziliak, J. P. (2018). Income inequality and the labor market in Britain and the US. *Journal of Public Economics*, 162(2018), 48–62. http://dx.doi.org/10.1016/j.jpubeco.2018.04.001

Burniaux, J. M., Padrini, F., Brandt, N. (2006). Labour market performance, income inequality and poverty in OECD countries. OECD Economics Department Working Papers (Working Paper No. 500).

Calderón, C., Chong, A. (2009). Labor market institutions and income inequality: An empirical exploration. *Public Choice*, 138(1/2), 65–81. https://doi.org/10.1007/s11127-008-9339-1

Carrera, J. E., de la Vega, P. (2018). Does inequality affect investment in a nonlinear way? A cross country analysis. IV Jornada de Investigación en Ciencias Económicas Conference Paper. [Retrieved 2021-07-05] Available at: http://sedici.unlp.edu.ar/handle/10915/110317

Catalano, M., Pezzolla, E. (2015). The interaction between the labour tax wedge and structural reforms in Italy. *Revue de l'OFCE, Presses de Sciences-Po*, 0(5), 185–223.

Checchi, D., Garcia-Penalosa, C. (2005). Labour market institutions and the personal distribution of income in the OECD. IZA Institute of Labor Economics Discussion Papers (Discussion Paper No. 1681).

Checchi, D., Garcia-Penalosa, C. (2008). Labour market institutions and income inequality. *Economic Policy*, 23(56), 602–649. https://doi.org/10.1111/j.1468-0327.2008.00209.x

Checchi, D., Garcia-Penalosa, C. (2010). Labour market institutions and the personal distribution of income in the OECD, *Economica*, 77(307), 413–450. https://doi.org/10.1111/j.1468-0335.2009.00776.x

Choi, I. (2001). Unit root tests for panel data. *Journal of International Money and Finance*, 20(2), 249–272. https://doi.org/10.1016/S0261-5606(00)00048-6

Clark, C. M. A., Kavanagh, C. (1996). Basic income, inequality, and unemployment: Rethinking the linkage between work and welfare. *Journal of Economic Issues*, 30(2), 399–406. https://doi.org/10.1080/00213624.1996.11505803

Coenen G., McAdam, P., Straub, R. (2007). Tax reform and labor market performance in the euro area: A simulation-based analysis using the new area-wide model. European Central Bank Working Paper Series (Working Paper No. 747).

Dalton, H. (1954). Principles of public finance. Fourth edition. London: Routledge and Kegan Paul Ltd.

Daudey, E., García-Peñalosa, C. (2007). The personal and the factor distributions of income in a cross section of countries. *The Journal of Development Studies*, 43(5), 812–819. https://doi.org/10.1080/00220380701384406

Daveri, F., Tabellini, G. (2000). Unemployment, growth and taxation in industrial countries. *Economic Policy*, 15(30), 48–104. https://doi.org/10.2139/ssrn.52787

de Groot, H. L. F., Tang, P. J. G., Nahuis, R. (2004). Is the American model miss world? Choosing between the Anglo-Saxon model and a European-style alternative. Utrecht University School of Economics Tjalling C. Koopmans Research Institute Discussion Paper Series (Paper No. 04-26).

Ederveen, S., Thissen, L. (2004). Can labour market institutions explain unemployment rates in new EU member states? European Network of Economic Policy Research Institutes Working Papers (Working Paper No. 27).

Edizdoğan, N., Çetinkaya, Ö., Gümüş, E. (2013). Kamu maliyesi. Bursa: Ekin Basım Yayın.

Elwell, J, Corinth, J. K., Burkhauser, R. V. (2020). Income Growth and Its Distribution from Eisenhower to Obama: The Growing Importance of In-Kind Transfers (1959–2016). In D. Furchtgott-Roth (Ed.), United States income, wealth, consumption, and inequality. Oxford: Oxford University Press.

Erauskin, I. (2020). The labor share and income inequality: Some empirical evidence for the period 1990-2015. *Applied Economic Analysis*, 28(84), 173–195. https://doi.org/10.1108/AEA-04-2020-0028

Francese, M., Mulas-Granados, C. (2015). Functional income distribution and its role in explaining inequality. IMF Working Papers (Working Paper No. 15/244).

Forbes, K. J. (2000). A reassessment of the relationship between inequality and growth. *American Economic Review*, 90(4), 869–897. https://doi.org/10.1257/aer.90.4.869

Galor, O., Zeira, J. (1993). Income distribution and macroeconomics. *The Review of Economic Studies*, 608(1), 35–52. https://doi.org/10.2307/2297811

Günel, T. (2020). The relation of tax wedge and unemployment in G-7 countries: Panel co-integration analysis. Vergi Raporu, 255(12), 78–90.

Hayakawa, K. (2007). Small sample bias properties of the system gmm estimator in dynamic panel data models. *Economics Letters*, 95(1), 32–38. https://doi.org/10.1016/J.ECONLET.2006.09.011

Hodge, S. A., Hickman, B. (2018). The importance of the tax wedge on labor in evaluating tax systems. Available at: https://files.taxfoundation.org/20180913095728/Global-Primer_tax_wedge.pdf

Hsiao, C. (2003). Analysis of panel data. Second Edition. New York: Cambridge University Press. ISBN 978-0511754203

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

Iosifidi, M., Mylonidis, N. (2017). Relative effective taxation and income inequality: Evidence from OECD countries. *Journal of European Social Policy*, 27(1), 57–76. https://doi.org/10.1177/0958928716672182

Jacobson, M., Occhino, F. (2012). Labor's declining share of income and rising inequality. Federal Reserve Bank of Cleveland. Available at: https://www.clevelandfed.org/newsroom-and events/publications/economic-commentary/economic-commentary-archives/2012-economic commentaries/ec-201213-labors-declining-share-of-income-and-rising-inequality.aspx

Jung, H., Kwon, H. U. (2007). An alternative system GMM estimation in dynamic panel models. Hitotsubashi University Hitotsubashi Institute for Advanced Study Discussion Paper Series (Paper No. 217).

Kakwani, N. C. (1977). Measurement of tax progressivity: An international comparison. *Economic Journal*, 87(345), 71–80. https://doi.org/10.2307/2231877

Kalyva, A., Princen, S., Leodolter, A., Astarita, C. (2018). Labour taxation and inclusive growth. European Commission Directorate-General for Economic and Financial Affairs European Economy Discussion Papers (Paper No. 084).

Karabarbounis, L., Neiman, B., Adams, J. (2014). Labor shares and income inequality. Society for Economic Dynamics Meeting Papers (Paper No. 539).

Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review*, 45(1), 1–28.

Madrick, J., Papanikolaou, N. (2010). The stagnation of male wages in the US. *International Review of Applied Economics*, 24(3), 309–318. https://doi.org/10.1080/02692171003701495

Lambert, P. J. (2001). The distribution and redistribution of income. Manchester: Manchester University Press.

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

Li, H., Zou, H. F. (1998). Income inequality is not harmful for growth: Theory and evidence. *Review of Development Economics*, 2(3), 318–334. https://doi.org/10.1111/1467-9361.00045

Musgrave, R. A. (1959). The theory of public finance: A study in public economy. New York: McGraw Hill Book Co.

Ochmann, R., Peichl, A. (2006). Measuring distributional effects of fiscal reforms. University of Cologne Institute for Public Economics FiFo Discussion Papers (Paper No. 06-9).

OECD (2021a). Tax Wedge (indicator). Available at: https://doi.org/10.1787/cea9eba3-en

OECD (2021b). Taxing Wages 2021. OECD Publishing, Paris. Available at: https://doi.org/10.1787/047072cd-en

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal*, 9(1), 86–136. https://doi.org/10.1177/1536867X0900900106

Rossvoll, E. M., Sparrman, V. (2015). Labor market institutions and wage inequality in the OECD countries. Statistics Norway Research Department Discussion Papers (Paper No. 826).

Sattarhoff, C. (2010). GMM estimation of multifractal random walks using an efficient algorithm for hac covariance matrix estimation. Leibniz Information Centre for Economics Ruhr Conference Papers (Paper No. A19-V3).

Solt, F. (2020). Measuring income inequality across countries and over time: The standardized world income inequality database. *Social Science Quarterly*, 101(3), 1183–1189. https://doi.org/10.1111/ssqu.12795

Soto, M. (2009). System gmm estimation with a small sample. Unitat de Fonaments de l'Anàlisi Econòmica (UAB) and Institut d'Anàlisi Econòmica (CSIC) Working Papers (Working Paper No. 780.09).

Suits, D. B. (1977). Measurement of tax progressivity. *The American Economic Review*, 67(4), 747–752.

Todorović, J. Đ., Đorđević, M., Ristić, M. (2018). The Tax wedge as the determinant of unemployment: A comparative overview of OECD countries and Serbia. Paper presented at the 49th International Scientific Conference Quantitative and Qualitative Analysis in Economics.

Trpeski, P., Tashevska, B. (2012). Labour tax wedge in the republic of macedonia-trends and international comparison. *Annales Universitatis Apulensis Series Oeconomica Alba Iulia*, 2(14), 1–24.

Urban I., Čok, M., Verbič, M. (2019). The burden of labour taxation in Croatia, Slovenia and Slovakia in the period 2011–2017. *Economic Research*, 32(1), 1430–1456. https://doi.org/10.1080/1331677X.2019.1638291

Vanhoudt, P. (1997). Do labor market policies and growth fundamentals matter for income inequality in OECD countries?: Some empirical evidence. *IMF Staff Papers*, 44(3), 356–373. https://doi.org/10.2307/3867564

Verbeek, M. (2017). A Guide to modern econometrics. Fifth Edition. Hoboken, NJ: John Wiley and Sons, Inc.

Verhoogen, E. A. (2008). Trade, equality upgrading and wage inequality in the Mexican manufacturing sector. *The Quarterly Journal of Economics*, 123(2), 489–530. https://doi.org/10.1162/qjec.2008.123.2.489

Vickrey, W. (1947). Agenda for progressive taxation. *American Political Science Review*, 41(5), 1016–1017. https://doi.org/10.1017/S0003055400260814