

Tax Wedge Phenomenon and Its Possible Analytical Impacts on the Investments in OECD

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Abstract In this study, we aim to put forth the tax wedge case that affects both the labor costs and the proposed investment level that also means economic growth through the public decision-making process in an analytical framework. Given that the tax wedge is the proportional difference between the tax paid by a taxpayer worker and the cost to the employer, it is understood that the effect levels also create different differential effects. In this context, it is necessary to question the analytical relationship between the tax wedge and the tax burden. The relationship between this systematic-analytical structural relationship and economic growth also means examining possible externalities in their impact levels. It seems that this effect on OECD countries reveals significant differences according to the development levels of the states. Besides, the breaking point where these differences are substantial in terms of our determinations is the tax burden of nations, and it is understood that the proportional changes in the tax wedge are directly affected by this financial fact. In addition, the fact that OECD countries also have different tax burdens, the differences between tax systems in practice also differentiate the analytical relationship between the tax wedge and tax burdens. However, the measures related to the deviations of global financial and economic relations between OECD countries reveal that possible analytical differences between tax wedge and tax burdens have tried to be overcome via the fundamental systemic financial restructures in recent years.

Keywords Economic Growth, Labor Costs, OECD, Tax Burden, Tax Wedge

JEL Codes: F61, F63, H21, H87.

impact it has had on investments recently. In this context, a tax wedge is a structural differential approach calculated based on the tax rates paid by the average worker who is childless, single, and all of his income. This fact bases on priority the proportional difference between the amount of tax paid by a worker in this position and the labor cost. Despite its short definition, the tax wedge concept also includes different conceptual approaches in which it creates a direct impact level. Therefore, it is from this point that the differential levels of impact we consider in our approach need to be addressed in an analytical framework and with the concepts it contains. The impact of the tax wedge phenomenon on investments as a labor cost is measured as a percentage of labor cost. Certainly, this approach can be understood by the level of impact of tax amounts on labor-related to employment.

The limiting effect of possible tax increases on labor in a production process takes place in the process with the concept of Tax Wage, which means that is a result of the employment costs it creates. The protection of the difference between the wage that a worker has in the conditions we touched after the net tax after taxes and the labor cost that the employer imposes has made it necessary to be determined according to the *Discrimination Principle* regarding the labor income over the increasing rate of personal income tax. In this context, the priority dynamics in the creation of the hypothesis of our study made it necessary to question it as a whole of values that affect investment variability. In this approach, the aim is to question the variations in investments in a process where the tax wedge creates an impact scale, and our hypothesis is enforced by structural dynamics. In fact, this framework in which our hypothesis regarding the creation of our model has been questioned is this analytical framework in question. Therefore, reaching the net data intended for the model in questioning our hypothesis is quite meaningful to understand the analytical clarity of the tax wedge. In this respect, questioning the impact scale of the tax wedge has

1. Introduction

The tax wedge is one of the tax burden phenomena, which has been discussed quite frequently with the level of

made it necessary to discuss the appropriateness of the values put forward as hypotheses as well as the intended values to be emphasized. Undoubtedly, also another primary purpose in our study is to question the accuracy of the findings as current values within the scope of OECD and the future significance of structural change values on investments.

In this context, it should be emphasized that the proportional decreases for the effect of tax wedge after 2018 as the OECD average are not caused by a decreasing effect being average in OECD, but from four OECD countries. These countries are Estonia (-2.54 per cent), USA (-2.19 per cent), Hungary (-1.11 per cent) and Belgium (-1.09 per cent) (OECD, 2019-a). Meaningful changes in corporate financial practices as well as tax reforms after 2015 have played an important role in the decreasing tax wedge rates in these countries for recent years. In this context, it should be emphasized that the average cost for an employee consists of the sum of the *Social Security Payments*, the *Deduction of Cash Benefits* and the *Total Labor Costs*, and the sum of the values expressed (OECD-a, 2020). In this context, it appears clearly that the tax wedge effect due to the tax burden has increased in OECD and EU countries in recent years. It should be stated that this effect creates a double-sided a tax wedge emphasis effect on the proportional difference between the labor costs and the post-tax wage of a worker under fixed conditions (OECD, 2018-a). The employer, which is the subject of increasing labor costs after taxes, will be able to make decisions contrary to the cyclical economic-fiscal adjustment with its more hesitant attitude in the production and investment process (UNCTAD, 2018). It should not be overlooked that the tax wedge effect can continue at the same negative effect level in a structure where there is no tax regulation to reach the target investment levels, especially in the periods of conjuncture expansion (Lehmann et al., 2016). On the other hand, the effect of a tax wedge, which becomes meaningful with the tax burden, causes a negative deviation on the real purchasing power of the employee with the impact of the tax emphasis on the employee in question that means that a more potent effect of the tax wedge (European Commission, 2020). In after-tax income from household consumption as a function of directly affected by the wage-price equilibrium, these deviations are seen as a cause of in the many OECD and EU countries falling investment and employment (Nerudová and Dobranschi, 2016).

2. Literature Review

It appears that the study by OECD in 2007 was one of the most critical studies on OECD countries related to the tax wedge. In this study by the OECD, significant clarity was given to the conceptual definitions, and it tried to be emphasized the effect of the tax wedge on labor income.

The study is meaningful, especially in terms of trying to explain the relationship between tax burden and tax wedge based on OECD countries (OECD, 2007). Besides, it can be said that the priority of analytical studies related to Tax Wedge was the work done by Radu et al. in 2017 (Radu et al. 2017). The meaningful aspect of this study is that it deals with the Tax Wedge phenomenon both on OECD and EU basis in each other. The study, based on the Cluster Analysis, the relationship between employment and income levels was handled within the framework of a hierarchical model, and it aimed to determine possible deviations by examining the linear cluster distribution variations of the Tax Wedge effect between countries. OECD's works are significant in recent studies on tax wedge. OECD has put forward reviews on the Tax Fee and Tax Wedge for almost every year in this regard and has emphasized the changes between labor costs and tax burdens for recent years (OECD, 2019-b). Besides, the study conducted by Hodge and Hickman in 2018 is considered as a meaningful study in terms of revealing the concepts related to Tax Wedge and Tax Wages more clearly for labor assessments (Hodge and Hickman, 2018). In the study, the conceptual framework of the tax wedge on the workforce as related to the evaluation of tax systems has discussed. Undoubtedly, the analytical work carried out by the European Commission on the Tax Wedge issue in 2020 is very meaningful, given that most of the OECD countries are EU countries. In this study, the impact of the tax wedge on the workforce of about twenty-five EU countries is handled in a structure that takes into account also other tax practices, and it is aimed to examine the distribution of labor taxes within the scope of total tax revenues (European Commission, 2020). The findings in the study are significant in terms of revealing an increase in the effectiveness of the Tax Wedge effect in tax applications within the EU.

3. The Position and Structural Relationship of the Impact Dynamics in the Tax Wedge Phenomenon

Countries trying to reach their economic growth targets have developed important strategies in their efforts to reduce tax rates on labor in tax wedge applications for a long time. Because increasing labor costs with tax burdens require a process in which labor costs and tax burdens are balanced with the level of negative impact on investments (Dolenc and Laporšek, 2010). This approach means the recognition of an impact process in which the impact dynamics of the Tax Wedge are also emphasized. The economic growth rates of countries and differences in tax burdens in the relevant process also differentiate the possible levels of analytical impact of the tax wedge between countries. Although there are no significant differences in the average impact rates of the tax wedge for

OECD countries, the proportion of changes in worker wages has entered a period of decline after 2018, albeit very small (Dolenc et al, 2011).

3.1. The Theoretical Framework of Tax Wedge Connected with the Tax Burden Dynamics

Most of the studies on tax wedge revealed a negative-inverse relationship between tax wedge and employment rates. In this respect, the position of the tax burden proportional values in the process is an important phenomenon that needs to be determined. In addition to the increasing social security taxes in recent years, the fact that personal tax rates are subject to an increase above the EU and OECD average is considered among the reasons that further increase the tax wedge effect. Firstly, to understand the structural relationship of the tax burden with the tax wedge, it is necessary to reveal how the labor costs occurred and then also the fundamental analytics of the Tax Wedge effect directly related to this structural location. In this context, the labor cost of the labor, whose income is not shared by others, and the worker of a fixed income worker under childless conditions can be expressed as follows (Hodge and Hickman, 2018).

Undoubtedly, employees receive cash-transfer benefits through public legal regulations as well as from the sectors in which they work. These wages must deduct from the earnings of the worker for the amounts of wages received by this worker. Also, this structural formation covers that the income together with social insurance taxes includes being also deducted from employee wage earnings including the deducted cash transfers. This situation can be stated as follows (OECD, 2018-a).

$$\begin{array}{l}
 \text{Average} \\
 \text{Employee Wage Earning} + \text{Employer Social Insurance \& Payroll Taxes} = \text{Total Labor} \\
 \text{Costs} \\
 \\
 \text{Net} \\
 \text{Employee Wage Earnings} - \text{Income \& Social Insurance Taxes} + \text{Cash Transfers} = \text{Take-Home} \\
 \text{Pay} \\
 \\
 \frac{\text{Average Total Labor Costs} - \text{Net Take-Home Pay}}{\text{Average Total Labor Costs}} = \text{Tax Wedge}
 \end{array}$$

In this context, the tax wedge phenomenon can be defined as the difference between the two cases, whose definition we have presented above. The aim is to find the proportional value of labor costs attributed to taxes. This value represents the total average tax burden of the government on income and taxes on mandatory social security taxes on workers and employers (Hodge and Hickman, 2018: 3):

In this respect, understanding the impact level of possible tax burdens is important to understand the structural position of the tax wedge in the process:

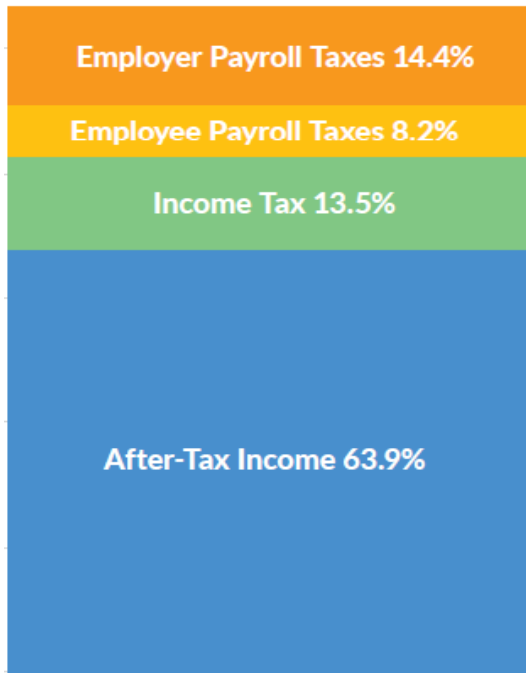
- The level of impact of the tax burden in terms of welfare losses put forth an important substitution effect on the workforce. It is observed that the income effect of the tax burden is mostly related to reducing

the employment on the employer. It is inevitable that both consequences of this situation will have a narrowing effect on production. It should be emphasized that increasing tax burdens are an important reason for the financial reforms in EU and OECD countries. This position of the tax burden, which increases the effect of the tax wedge, also reveals that there is no balanced distribution of the national tax burden (Paturot et al., 2013).

- Even though the effect of the tax burden on income distribution is tried to be softened by an increasing rate of tax structure, the fixed position of the current tax height often does not result in a positive effect on tax burdens (Paler, 2013). Because, within the scope of public financing policies for tax wedge and tax burdens reaching an optimal point, the said structural obstacles might not show a positive result in the tax burden being reduced to the desired level and its relationship with the tax wedge. In this respect, it appears that the approaches related to tax wedge to create a positive impact level make the expectation (Danijel and Iva, 2017). The fact that it is mentioned this phenomenon would have an absolute non-positive effect in terms of the tax burden and also affect the income distribution even more negatively (Paturot, 2018).
- The different positions of tax burdens in tax practices, which are the subject of tax, also differentiate tax burden distributions between sectoral tax burdens (Hines JR, 2017) and personnel tax burdens. The fact that wages subject to direct taxes are subject to an increasing proportionality than the rates at which capital gains are taxed also differentiates the tax emphasis between the parties as a result of the further negative impact of the tax burden distribution (OECD, 2018-b). On the other hand, the political structure of the taxation process further strengthens the negative cyclical effect of the tax wedge, as the tax burdens weaken the fixed-wage incomes as well as affecting the labor costs on wages. This phenomenon can also be expressed as the effect of the inconsistent nature of the cyclical change process with tax burdens on the tax wedge. However, since the differential effects of taxes in practice are complicated to detect, the relationship of the tax burden with the tax wedge would be meaningful as a result of the inclusion of alternative tax burdens in the process (Paler et al., 2017). However, in tax burden approaches to increase labor costs, it is not possible to exclude the potential positive effects of regulatory taxes in terms of understanding the likely impact of the tax burden (OECD, 2016). In this framework, the structural impact level of tax burden dynamics with the tax wedge reveals an effect level that can be explained by the dynamical multi-faceted structure of the conjuncture (Stephen and Xing, 2015).

In the analysis of the structural relationship of the tax burden on labor income to the tax wedge, it is important to interpret the tax burden change values on the basis of OECD countries.

Table 1. Tax Burden on Labor and Employer, and Percentage Distribution in Total Tax Rates in OECD, 2019*



* As a Percentage Distribution in the Total Tax Income

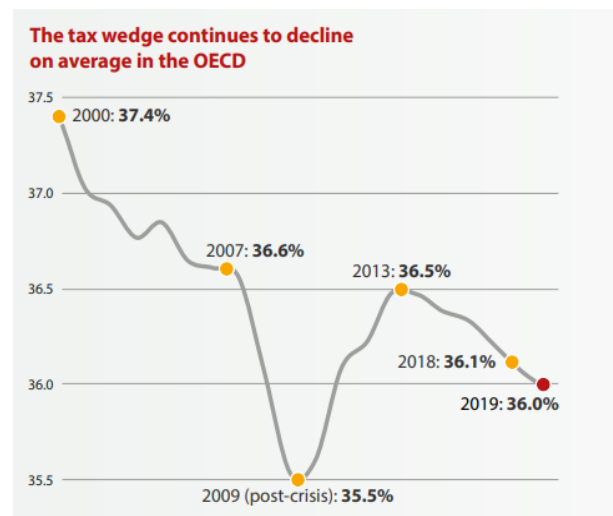
Source: Asen, E. (2019). *A Comparison of the Tax Burden on Labor in the OECD-2019*, Tax Foundation Fiscal Fact, No: 655, Washington D.C.: Tax Foundation, May 2019.

Table 1 shows the percentage tax distribution of employer-worker and income tax rates among OECD countries for 2019. In terms of tax wedge, the bilateral distribution is observed to represent approximately one-third of the tax in OECD countries. In addition to the other direct taxes together with add indirect taxes complement other 63.9 tax rates. As it is seen in Table 1, the effect of the tax wedge is bilaterally monitored and it is observed that the effect of the tax wedge is more than the possible impact on the employee. In fact, it is possible to say that the phenomenon of tax wedge expresses differences that it is between the workers receive a net wage and the cost of the worker in question. However, when compared with other total taxes, it is understood that the tax cost of the tax wedge is proportionally higher than the income tax values obtained. At this stage, it is observed that the average growth rate and average tax burden rates in the OECD create possible deviations on the tax wedge and these deviations are also in the tax trends on the workforce and especially after the 2009 global crisis.

3.2. The Appearance of the Wedge and the Significant Alterations in Some OECD Countries

The tax wedge has been the subject of significant

changes as an average value in OECD countries. These changes can be said to have reached the most striking point after the 2009 global financial crisis. With the effect of the financial crisis, OECD countries cannot be said to increase their tax burden on both the employer and the employee in order to close their public deficits. In addition, with the inclusion of the relevant income tax, the wedge effect decreased even more as an average value. In these deviations, the important point in terms of tax wedge is that the production volume affected by the financial crisis is has a negative impact on both investments and employment. It is observed that the income tax amounts decrease as a result of the decreasing production level and employment due to the financial crisis (OECD, 2000). It is also possible to interpret this phenomenon as a tax tendency above labor income. It is possible to see this change after 2000 in Graphic 1 below:

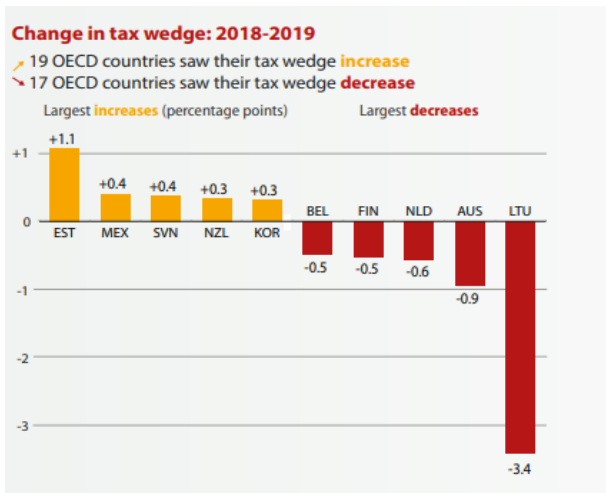


Source: OECD (2020-b), *Tax Wages-2020*, Paris: OECD Publishing, 2020.

Graphic 1. Trends in Labor Taxes as Tax Wedge for OECD Countries after 2000

In Graphic 1, it is clearly observed that the taxes on labor caused significant deviations during the 2009 financial crisis phenomenon. While the tax on labor income in 2000 was around 37.45 percent, it is observed that this rate decreased to 35.5 percent in 2009. This deviation from labor income is also a view of the total tax burden, in which markets affect income tax rates. In particular, the income tax rates paid by employers have been effectively caused to an increase in the tax burden, and it is observed that the tax burden rate is quite close to the total tax burden monitored in Table 1 for 2019. These proportional values also refer to the proportional distribution of the tax wedge in the OECD countries within the total tax rates and its tax impact rates are meaningful. Certainly, the meaningful approach here is the position of tax rates on labor incomes interpreted as tax wedges. In Graphic 1, it can be said that the tax rates on labor income is quite high in contrast to many OECD countries. The reason for the decrease in the tax rate that

caused the tax wedge on labor incomes after the 2009 crisis is the unemployment rate that increased during the crisis period (OECD, 2014). However, these rates are still highly significant burden on labor income in terms of the increasing impact of the tax wedge. There are two important reasons why this average is high. The first is that there is no tax distinction regarding labor-capital taxation in most OECD countries. The second important reason is that in the majority of OECD countries, especially the tax wedge effect on labor income has increased in contrast to some countries. It is possible to follow this proportional-structural change related to tax wedge in recent years in Graphic 2 below:



Source: OECD (2020-b), *Tax Wages-2020*, Paris: OECD Publishing, 2020.

Graphic 2. OECD Countries to between 2018-2019 Yearly Changes Rates of Tax Wedges

In Graphic 2, although there is an increase in annual tax wedge change rates for 2018-2019 especially in developing countries, it is observed that there are decreases in proportional impact values related to tax wedge phenomenon in developed countries such as Belgium, Finland, and Australia. At this point, the tax wedge effect in Lithuania has decreased by a significant decrease from 2018 to 2019, at about 3.5 percent. Even though these decreases in tax wedges are considered significant in terms of targeted increases in capital productivity in the countries' production process, the increasing public financing requirement for the less developed countries such as Mexico and Estonia have prevented the deviations regarding the decrease in tax burden. In this context, the need for public financing of developing countries and frequent application of new tax applications increased the tax wedge effect. Also, this development between 2018-2019 is a process of change compatible with previous years. The process for Lithuania to reduce the tax wedge burden resulted due to the important tax reforms in this country for the same years and has been the subject of restructuring policies (KPMG, 2018). Increasing rates of

the tax wedge in Graphic 2 for developing countries have undoubtedly been the subject of these increases in calculated values, including social security taxes, unemployment benefits, and taxes withheld at the source.

Therefore, the distribution of the marginal and average tax burden per employee causes also an increase in the costs of wages on the employer. In developing countries, this phenomenon causes different tax emphases, and thus different tax wedges impact scales as a result of countries having different tax burdens (Piketty and Saez, 2012). This fact causes a significant tax wedge effect as a labor wage costs that include the other tax costs, which effects the employer tax burden but indirect to an employer. On the other hand, the fact that developing countries have very limited savings limits is accepted as an important result of a high marginal tax burden (Saez et al., 2012) That means the increase of the tax wedge in especially developing countries that cause a decrease in moderate wage rates has gotten to be more increased the increasing financial problems due to affect negatively on investment related to GDP growth like appeared in Graphic 2. In OECD countries, the financial burden of the tax wedge creates possible deviations on investments, as well as a structural relationship with possible wage increases on labor. The average deviations caused by the increased tax burden on labor income are interpreted as an important impact level of the tax wedge (OECD, 2015). In this context, the average change effect in labor wages is a view of the scale effect of the tax wedge on wages.

The Framework of Econometric Analysis Method and Empirical Findings

The variables that create an average median change effect on labor incomes reveal a regression relationship in the process with the growth rates of OECD countries, as well as the investment and tax wedge change effects. Therefore, analytical results regarding the possible effects and changes in wage costs are meaningful for the analysis of the tax wedge as related to average investment rates OECD. The main framework of our empirical study is undoubtedly the average debt burden of the tax wedge in OECD that is related to the other independent variables, and the investments under OECD. However, understanding the impact of the tax wedge makes it a priority to question the extent to which the tax wedge effect affects investments across the OECD as an average. Because the studies on tax wedge primarily show their effect levels on investments, and the deviations in total investments as the OECD average reveal that besides the tax wedge, capital efficiency and the impact of the OECD average tax burden cannot be ignored. Our model is the analysis model called Auto-regressive Distributed Lag Models (ADRL) for time series analysis. First of all, the Reciprocal Meaning Expression of Concepts in Auto-Regressive Distributed Lag Models (ARDL):

Table 2. The Reciprocal Meaning Expression of Concepts in Auto-Regressive Distributed Lag Models (ARDL)

OECD_INVSTM	Average Changes in Investment Rates in OECD
OECD_VY__	Average Tax Burden Changes in OECD
OECDPERCAPITAPRODUCTIVITY	Average Changes in Capital Efficiency Per Capita at OECD
OECDTAX_WEDGE_LABOR_COSTS	Average Changes in Tax Wedge on Labor at OECD as Labor Costs

The main theory of our time series approaches as express:

$$Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \quad (1)$$

In our model, proportional annual changes in annual investment variations in the average of OECD countries are taken as the dependent variable. As the variables, which have an impact scale on the other dependent variable have also been included in our ADRL estimation model as yearly changes in the average tax burden and average proportional tax burden or tax costs on the workforce as an average of OECD countries. And also, increase rates of annual changes related to per capita productivity have been included in this ADRL estimation model:

$$\text{OECD_INVSTM} = \text{OECD_VY} + \text{OECDPERCAPITAPRODUCTIVITY} + \text{TAX_WEDGE_LABOR_COSTS} \quad (2)$$

In the framework of the model we established in Equality 2, the dependent variable is "The Annual Rate of Change in Total Investments- OECD_INVSTM" showing the average of total investments in OECD. The independent variables in our model are "Capital Efficiency Per Capita-OECDPERCAPITAPRODUCTIVITYOECD" as the OECD average, the OECD average "Tax Burden-OECD_VY", and then "The Tax Burden on Labor-OECDTAX_WEDGE_LABOR_COSTS" as labor costs as an OECD average.

Testing the Stability of the Model

To maintain ensuring meaningful our model the variables series via the unit root test has been determined to meaningful in the test model in the unit root test. Performing the Unit Root Test of the model was made for non-stationary sequences, and all-time series sequences were included in our analysis in our model as stationary.

In order to test the stability of the model each time series forming the model was subjected to "Unit Root Test"

intended to get rid of the error terms to provide the "H = 0" hypothesis via the first difference (-1), which is aimed to ensure the stability in all sequences. It is accepted that taking the primary differences (-1) of the sequences results in meaningful-stabile probability values due to being less than "0.05" (significance value: <0.05) and it is sufficient to take the primary differences. In this respect, it is not accepted that other differences should be taken. Augmented Dickey-Fuller Test (ADF) was preferred in determining the stasis of the series and unit root test determinations were performed in this framework (Aritova and Federova, 2016). In the unit root test, the following structural framework of the Augmented Dickey-Fuller Test has been adopted:

$$\Delta X_t = \alpha_0 + \beta t + \rho X_{t-1} + \sum_{i=1}^k \beta_i \Delta X_{t-i} + \varepsilon_t \quad (3)$$

$$H_0 : \sigma_u^2 = 0$$

$$H_1 : \sigma_u^2 \neq 0$$

(Fixed and Trend Model)

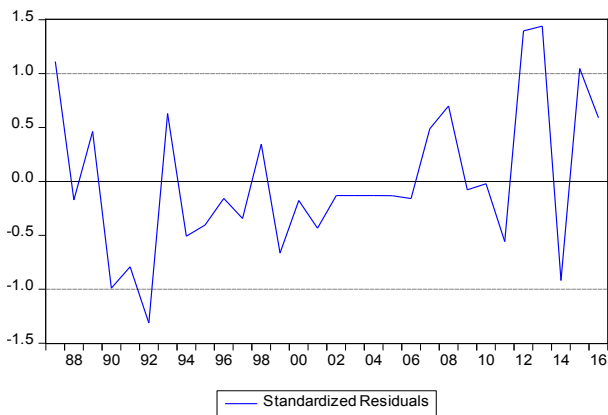
$$\Delta Y_t = \alpha + \beta t + \delta Y_{t-1} + \sum_{j=2}^k \delta_j \Delta Y_{t-j+1} + e_t \quad (4)$$

With the Augmented Dickey-Fuller approach, the prediction model that is taken in terms of difference (-1) has been taken in the unit root test application, was accepted as *stationary* as the probability values gave the desired values. The number of delays in the Augmented Dickey-Fuller test has also been determined as Schwarz Info Criterion values and the " $\tau = \delta / S\delta$ " approach has been adopted in this delay. Our econometric estimation model cannot be rejected because the " $H_0 : \sigma_u^2 = 0$ " equation is achieved, which is in terms of the scope of $H_0 = 0$ values as a result of our test (Levin et al., 2002). The unit root test results of the series included in our prediction model are as follows:

Table 3. Unit Root Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OECD_INVSTM) (-1)	-1.278362	0.165245	-7.736182	0.0000
D(OECD_VY_) (-1)	-0.952089	0.170935	-5.569888	0.0000
D(OECDPERCAPITAPRODUCTIVITY) (-1)	-1.499784	0.148544	-10.09660	0.0000
D(OECDTAX_WEDGE_LABOR_COSTS) (-1)	-1.715531	0.225343	-7.611634	0.0000

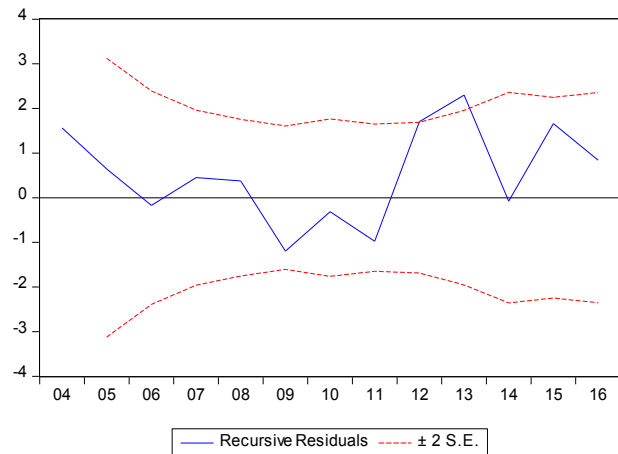
The fact that all probability values are "Zero" in the Unit Root Test results, in other words, being less than "0.05" (significance value: <0.05) within the framework of the approach expressing significance presents meaningful results that mean: The model emphasizes a stable structure, and that has been decontaminated throughout seasonally adjusted. Besides, the "t-statistics" values observed in Table 3 are above the variance distribution values for our model. This fact means that the standard deviations in the estimation model are in the normal-acceptable situation. It is also essential to follow a more meaningful view of these variances of the model that are related to Unit Root Values distribution as a graphical value distribution. The graphical delivery of the stationary of the series within the frame of unit root tests can be seen below:



Graph 2. The Appearance of Standardized Residual Graph

As observed in Graphic 2, the unit root distribution values of the model represent stationary and there is not any effective correlation that causes for the resulting in any deviation of the model as the distribution of values. Therefore, it can be said that the distribution of our model in Graphic 2 is quite static. It can be said that the major reason for the deviation in 2013 was the tax burden increasing that occurred after significant structural reforms in some OECD countries and possible deviations regarding total investments.

It is also meant to look at the Recursive Residual distribution to see the revised distribution of the unit root distribution balances in Chart 2. It is observed that the distribution in Graphic 3 below is compatible with the distribution in Graphic 2 and the unit root detection values. In Graphic 3, it is observed that the deviation in the unit root values for 2013 has occurred the deviation regarding because of formation of tax wedge in different effects in a significant portion of OECD countries. Indeed, while the Tax Wedge effect increased in some OECD countries as a cost on labor, it tended to decrease in some member countries. This express as the major reason for the deviation of the unit root value for 2013 and the fact that significant financial reforms in some OECD countries have affected the deviations of this year in terms of the unit root values. Graphic 3 shows the equivalent unit root distribution, below in terms of Recursive Residual.



Graphic 3. The Appearance of Recursive Residual

It was also observed that the value distribution in Graphic is compatible with the mean median values in the time series that make up our model. In order to test this significance results in another way, "Correlation Distribution Table" analysis of our model was also performed and it was observed that AC and PAC values expressed a significant distribution. Correlation Distribution Table of our model can be seen below:

Table 4. Correlation Distributions of Residues, 1983-2019

Date: 05/25/20						
Sample: 1983 2019						
Included observations: 30						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. .	. .	1	0.002	0.002	0.0002	0.990
. .	. .	2	0.068	0.068	0.1582	0.924
. .	. .	3	0.074	0.074	0.3508	0.950
. * .	. * .	4	0.112	0.109	0.8177	0.936
. * .	. * .	5	0.100	0.094	1.2032	0.945
. .	. .	6	0.006	-0.011	1.2047	0.977
. .	. .	7	0.013	-0.015	1.2116	0.991
. .	. .	8	0.004	-0.023	1.2122	0.997
. * .	. .	9	0.085	0.066	1.5453	0.997
. .	. .	10	-0.008	-0.013	1.5484	0.999
. .	. .	11	0.004	-0.003	1.5491	1.000
. * .	. * .	12	-0.099	-0.110	2.0738	0.999
. * .	. * .	13	-0.113	-0.136	2.7932	0.999
. .	. .	14	-0.053	-0.063	2.9606	0.999
. .	. .	15	0.014	0.045	2.9733	1.000
. ** .	. * .	16	-0.213	-0.175	6.0805	0.987

Analytical Testing the Model in terms of Accuracy:

In testing the accuracy of our model, we aimed to perform a meaningful result analysis by comparing the Least R-Squared values included in the "Ramsey Reset Test" application. Interpretation of the R-Squared with the ADRL estimation model approach, and the R-Squared after the Ramsey Test with the F-statistic values constituted the basic framework of our analysis. Analytical findings related to the value conjugate in comparing costs with F-statistic values were accepted as the main criteria for expressing the accuracy and meaning of our model. The analytical model values in terms of Ramsey Reset Test below and the probability deviation values have shown in Table 4 below:

Table 5. The Ramsey Reset Test Summary Values

	Value	df	Probability
F-statistic	0.077672	(1, 13)	0.7829
t-statistic	0.278696	13	0.7829
R-squared	0.622998	Mean dependent var	0.503453
Adjusted R-squared	0.156765	S.D. dependent var	1.259745

F-test summary:			
	Sum of Sq.	df	Mean Squares
Test SSR	0.103939	1	0.103939
Restricted SSR	17.50027	14	1.250020
Unrestricted SSR	17.39634	13	1.338180

The probability value for the F-statistic determined has determined as "0.7849" as shown in Table 5. The Ramsey Accuracy Formulation Test equation below was used for the Ramsey significance test in determining this value:

$$F = \frac{(R_{New}^2 - R_{Old}^2) / v}{(1 - R_{New}^2) / (n - k)} \sim F_{(v, n-k)} \quad (5)$$

$$F = [(0.622998 - 0.619739) / 4] / [(1 - 0.622998) / 37 - 1] = 0.7826$$

The "0.7829" probability value found in the F-statistics values in the findings determined by the Ramsey Reset Test reveals that it is approximately the same as the Ramsey transaction value we found after our analytical procedure. This result, which is compatible with the F-statistic value, is essential in terms of making the accuracy of our model meaningful. It is a result of our preferred Auto-Regressive Distributed Lag Models (ADRL) model, in which the probability values have a probability value of higher than 0.05. It is observed that the height of these probability values does not have a significant adverse effect on possible equivalence deviations in the model. The empirical results in this context and the significance of the results in different scale effects related to the ADRL model confirm this approach. On the other hand, another method proving our approach is the significant variance equivalents in the impulse interaction values determined by the VAR analysis of our prediction model, which have demonstrated in the empirical findings chapter.

4. Empirical Findings

First of all, the expansion differently variances of our prediction model as Auto-Regressive Distributed Lag Models (ARDL) is important for interpreting the coefficients in the findings due to the differences in the opening of our ADRL model reveal a significant effect scale. In other words, the considered variations in the effect level of differences related to the variables are also meaningful. As the ARDL prediction model, the evolution of the model variables in our model is as follows.

Estimation Equation as Auto-Regressive Distributed Lag Models (ARDL):

$$\begin{aligned} \text{OECD_INVSTMFARK} = & C(1)*\text{OECD_INVSTM} (-1) + C(2)*\text{OECD_INVSTM} (-2) \\ & + C(3)*\text{OECD_VY} + C(4)*\text{OECD_VY} (-1) + C(5)*\text{OECD_VY} (-2) \\ & + C(6)*\text{OECD_VY} (-3) + C(7)*\text{OECD_VY} (-4) \\ & + C(8)*\text{OECDPERCAPITAPRODUCTIVITY} \\ & + C(9)*\text{OECDPERCAPITAPRODUCTIVITY} (-1) \\ & + C(10)*\text{OECDPERCAPITAPRODUCTIVITY} (-2) \\ & + C(11)*\text{OECDTAX_WEDGE_LABOR_COSTS} \\ & + C(12)*\text{OECDTAX_WEDGE_LABOR_COSTS} (-1) \\ & + C(13)*\text{OECDTAX_WEDGE_LABOR_COSTS} (-2) \\ & + C(14)*\text{OECDTAX_WEDGE_LABOR_COSTS} (-3) \\ & + C(15)*\text{OECDTAX_WEDGE_LABOR_COSTS} (-4) + C(16) \end{aligned}$$

In the framework of the Auto-Regressive Distributed Lag Model, the effect coefficients of the variables, whose have been differences are taken on the dependent variable have listed as related to the variable positions below:

Substituted Coefficients:

$$\begin{aligned} \text{OECD_INVSTMFARK} = & + 0.0544402251614*\text{OECD_INVSTM} (-1) \\ & + 0.46612663182*\text{OECD_INVSTM} (-2) \\ & + 1.25251901367*\text{OECD_VY} \\ & - 0.354900078709*\text{OECD_VY} (-1) \\ & + 0.881977259825*\text{OECD_VY} (-2) \\ & + 0.464367440257*\text{OECD_VY} (-3) \\ & - 1.52538082799*\text{OECD_VY} (-4) \\ & - 1.01115857156e-05*\text{OECDPERCAPITAPRODUCTIVITY} \\ & + 7.66092523338e-05*\text{OECDPERCAPITAPRODUCTIVITY} (-1) \\ & + 6.80494003344e-05*\text{OECDPERCAPITAPRODUCTIVITY} (-2) \\ & + 0.859130332375*\text{OECDTAX_WEDGE_LABOR_COSTS} \\ & - 1.51821079911*\text{OECDTAX_WEDGE_LABOR_COSTS} (-1) \\ & + 1.23114977145*\text{OECDTAX_WEDGE_LABOR_COSTS} (-2) \\ & - 0.975840535982*\text{OECDTAX_WEDGE_LABOR_COSTS} (-3) \\ & + 0.97784773611*\text{OECDTAX_WEDGE_LABOR_COSTS} (-4) \\ & + 0.25245086398 \end{aligned}$$

In addition to the coefficient values on the dependent variable in the Forecast Model, it is possible to see the R-squared value and the standard error and t-statistic values of the variables as whole findings in the table 5.

Table 5 shows the periodic lagged scale effects of other independent variables on their average "OECD_INVST", which is the dependent variable in OECD investments. It is observed that the independent variables and especially the tax wedge effect have periodic significant effects on average investments for OECD. In addition to the impact of the tax wedge effect on investments as a dependent variable, it is observed that the average tax burden "OECD_VY", which is directly related to the tax wedge, has also a significant effect. In addition, capital efficiency per capita "OECDPERCAPITAPRODUCTIVITY" also constitutes an important impact scale with the effect of taxation. However, the fact that our topic is mainly tax wedge "OECDTAX_WEDGE_LABOR_COSTS" has made it a priority to question the impact of the tax wedge on dependent variable average OECD investments. Without taking the periodic difference of the tax wedge effect, it is seen that the said effect creates positive effect on average investments of OECD, albeit to a small extent. It is seen that a unit tax increase on labor income as a labor cost has a positive effect of "0.85913" on investments. This proportional positive increase in the labor costs can be explained by the "Income Effect" of the employees who supply labor. On the other hand, this approach means presenting more labor force to maintain the level of welfare in the short term under the influence of fixed tax. In this case, as a result of the positive effect, it is understood that it creates an effect on the investments, albeit a small one.

Table 5. Effect Values of Independent Variables and R-Squared Meaningfulness

Dependent Variable: OECD_INVSTM				
Method: ARDL				
Sample (adjusted): 1983 2018				
Dynamic regressors (4 lags, automatic): OECD_VY_FARK				
<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob. *</i>
OECD_INVSTM (-1)	0.054440	0.214754	0.253500	0.8036
OECD_INVSTM (-2)	0.466127	0.278551	1.673396	0.1164
OECD_VY_	1.252519	0.632028	1.981745	0.0675
OECD_VY_ (-1)	-0.354900	0.657636	-0.539661	0.5979
OECD_VY_ (-2)	0.881977	0.642391	1.372959	0.1914
OECD_VY_ (-3)	0.464367	0.794556	0.584437	0.5682
OECD_VY_ (-4)	-1.525381	0.771368	-1.977502	0.0680
OECDPERCAPITAPRODUCTIVITY	-1.01E-05	3.18E-05	-0.318426	0.7549
OECDPERCAPITAPRODUCTIVITY(-1)	7.66E-05	3.68E-05	2.082904	0.0561
OECDPERCAPITAPRODUCTIVITY(-2)	6.80E-05	3.25E-05	2.092741	0.0551
OECDTAX_WEDGE_LABOR_COSTS	0.859130	0.775811	1.107396	0.2868
OECDTAX_WEDGE_LABOR_COSTS (-1)	-1.518211	0.734893	-2.065894	0.0579
OECDTAX_WEDGE_LABOR_COSTS (-2)	1.231150	0.758840	1.622410	0.1270
OECDTAX_WEDGE_LABOR_COSTS (-3)	-0.975841	0.602339	-1.620086	0.1275
OECDTAX_WEDGE_LABOR_COSTS (-4)	0.977848	0.610991	1.600429	0.1318
C	0.252451	0.248900	1.014266	0.3277
R-squared	0.619739	Mean dependent var		0.0504

It is observed that the average tax burden phenomenon associated with the tax wedge also has a positive effect in the short term, where there is no periodic difference, and creates a "1.25251" scale effect on average investments close to the tax wedge effect. Our empirical findings reveal that the tax wedge has a negative impact on the average investment changes in the short term. It reveals that each unit tax increase related to tax cost related to tax wedge creates a deviation - or decrease on investments - on the scale of "-1.518" on average OECD countries. Although this effect creates a negative short-term effect, it can be mentioned that the effect of the tax wedge effect in the medium and long periods has a small positive effect with values such as "1.231", "0.977" and "0.252". Besides the fact that the effect of the tax wedge on the investments in the medium time period is again negative as "-0.975", can be explained by the periodic effect of the contradictions regarding the social policies. These values related to the impact of the tax wedge are also quite compatible with the criteria effects of the OECD average tax burden on average investment changes. On the other hand, the fact that per capita capital productivity creates a deviation of "-1.0105" on investments in the short term, can be explained by the fact that the investment desire has a negative scale effect on the employer due to the tax wedge effect. In the light of all these findings, it can be said that the tax wedge phenomenon reveals a variable and fluctuating structure according to the years in the proportional changes of the investments related to the OECD average and does not cause a significant deviation effect on the investments with

the presence of a positive effect as well as a negative effect. Besides, the determinations for VAR impulses-sensitivities regarding the tax wedge's average investments increasing in OECD and capital efficiency per capita confirms these findings. Graph 4 and Graph 5 present the graphically represented sensitivity of the average investment rate of the OECD tax wedge as labor costs, and on the per capita capital productivity:

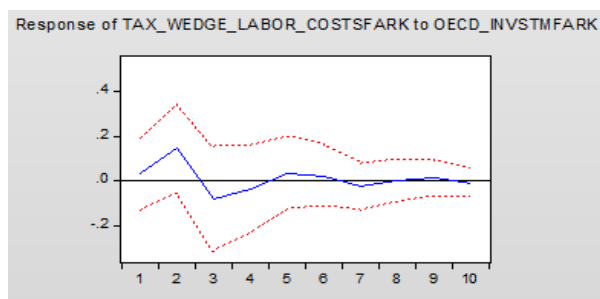
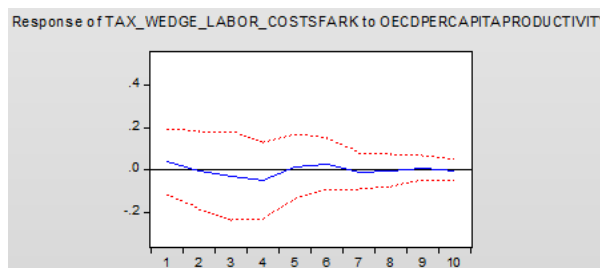
**Graphic 4.** Sensitivity of the Tax Wedge to Investment Variability**Graphic 5.** Capital Productivity Sensitivity of the Tax Wedge

Table 6. Distribution of Correlation Matrix Values 1983-2019

Variables	OECD_INVSTM	OECD_VY	OECDPER_CAPITA PRODUCTIVITY	OECDTAX_WEDGE_ LABOR_COSTS
OECD_INVSTM	1.0000	0.23991	-0.27634	0.02868
OECD_VY	0.23997	1.0000	-0.02759	0.26763
OECDPER_CAPITA PRODUCTIVITY	-0.27634	-0.02759	1.0000	0.01615
OECDTAX_WEDGE_ LABOR_COSTS	0.02868	0.26763	0.01615	1.0000

Table 7. Impact Values on Median and Standard Deviation Distribution

	OECD_INVSTM	OECD_VYK	PERCAPITAPRODUCTIVITY	TAX_WEDGE_LABOR_COST
Mean	0.606892	0.105714	0.608189	0.047543
Median	0.600000	0.100000	-0.300000	-0.050000
Maximum	5.200000	1.200000	36122.26	1.313940
Minimum	-4.000000	-1.000000	-36116.56	-1.363670
Std. Dev.	1.608468	0.442548	8513.428	0.580786
Skewness	0.111629	-0.040682	0.000801	0.112553
Kurtosis	4.745814	3.697620	18.49998	3.236280
Jarque-Bera	4.775637	0.719386	370.3846	0.164189
Probability	0.041830	0.697890	0.000000	0.921185
Sum	22.45500	3.700000	22.50300	1.759100
Sum Sq. Dev.	93.13810	6.658857	2.61E+09	12.14323
Observations	37	35	37	37

In Graph 4 and Graph 5, the determinations regarding the effect of the tax wedge effect on investments and capital efficiency in OECD are significant in terms of confirming the accuracy of our findings. It is possible to also interpret this significance as the distribution of correlation matrix values for all variables in our model. The impact scale values of the tax wedge effect in terms of investments and per capita capital efficiency presented in Table 6.

Table 6 shows that the coefficient scale values with tax wedge and other variables are compatible with matrix distribution values and negative and positive effects in our model result findings. The matrix value right ascension-evolution of the model has created the same effect level as the correlation values between the relevant years and affected the effect levels of the matrix expansion as the same median effect values.

It is possible to monitor the impact level of the tax wedge on the investments, the median, and probability values depending on the variability of the investments in Table 7 as the same meaning levels valid values. In Table 7, median and standard deviation values have the same sufficient criteria as "0.600" and "1.6084", and tax wedge in OECD has affected the average investment increasing rates in OECD as accompanying to these same effective criteria. Another significant factor in Table 7 is that it presents the average tax wedge effect in OECD is the highest reducing effect on average investments in OECD at the level of "-1.36364". This effect was found around

"1.3139" as the highest positive increase effect for investments. In this respect, it appears, that the impact of the tax wedge has not created a significant increase in average investments in OECD or as a decrease in investment expenditures.

5. Conclusions

As the average of the OECD countries, the scale effect of the *Tax Wedge* phenomenon OECD countries on annual investment variability has examined together with this event has been analyzed as being in the scope of the average tax burden in OECD and capital productivity per capita. Primarily, the impact of the tax wedge on investments has been found to affect average investments as both sides of this effect on both labor income and investment decisions. The tax wedge effect has also shown to yield meaningful increasing results with the change impact on the average tax burden in OECD and capital productivity per capita. Our study, covering the years 1983-2019, proved the existence of the tax wedge effect in the OECD in a process where the social developments in the world were taken into consideration but revealed Income Effect is more meaningful than the "Substitution Effect" on the workforce. It is observed that the short and medium-term effects of this effect, as well as the variability on average OECD investments, give meaningful and opposite results. On the other hand, increasing

unemployment rates in OECD countries after 2000 has created a process in which the labor is subject to more supply. It appears that this phenomenon depends on two important reasons that weakened the tax wedge effect.

The first, as this phenomenon is subjected to less tax substitution effect of the labor, is the increase in the acceptable limit of the burden of the laborers on this tax cost. But, it should not be ignored that this situation has an also positive but short-term negative impact on investments in the meantime. Second, the increased unemployment for the employer that cause wage advantage has significantly reduced the negative effect on the average investments increasing and even manipulated the effect of the tax wedge on investments as a positive. Our empirical findings support these structural alteration results via the observed scale effects. In this respect, it is understood that it is not possible to talk about a fixed negative effect of the tax wedge effect on strictly the annual average variability of the investments. It was also determined that this effect of the tax wedge has shown a very close the average tax burden impact to the tax wedge effect, as related to the model effect analyses, on the investments. Also, this situation, where the effect of capital productivity per capita on investments is lower than the tax burden effect - even positive, may be explained as an effect of the "Income Effect". Despite all this, it can be said that the periodic effect variations caused by the tax wedge effect in the OECD create a balance on the investments via self-internal effect values. In this context, it cannot be said that the tax wedge effect in 1983-2019 as related to annual variability in the average of OECD countries has a significant impact on OECD average investment variability. Although the deflection effect of the tax wedge on the investments is at the minimum scale of "-1.3636", but the fact that the maximum positive impact is at the range of effect "1.3139" supports this argument. However, the fact that the OECD average in investments is around "-4.0000", which is also meaningful as the imposed impact value by the other variables. Therefore, the OECD average tax burden and OECD per capita where the tax wedge is directly affected by the tax burden phenomenon and it should not be overlooked that it can have a holistic effect with per capita productivity.

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