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Changes in Public Borrowing in the OECD and the Impact Scale of Capital Productivity and Tax Burden

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Abstract This study aimed to determine the impact scale of some significant macro average criteria to evaluate increasing public borrowings expenditures in OECD countries. Different fiscal and economic dynamics constitute a meaningful effect mechanism at the global level regarding the public borrowing that has grown within the scope of the OECD in recent years. Undoubtedly, the main dynamics of these effects are the structural changes in the capital increases of OECD countries and the differences in capital productivity limits, which have a significant global impact related to OECD's average public incomes. Therefore, it is necessary and important to assess this fact with mutual correlation effects within the scope of average public borrowings due to the required elemental analyses of the changed levels of public borrowings. In other words, the different development levels of OECD countries and the changes in the capital efficiency values put forth that this fact directly related to the concerned public borrowings levels and public borrowings requirement levels intended for economic development, including fiscal practicing effects in this process. Therefore, it appears that these concerned variables average of OECD countries on the evaluation of the limits for the increase of public borrowings put forth a meaningful impact related to the ratio of investments levels and the effect of the tax burden. In brief, the proportion of investment and tax burden to GDP creates a meaningful convergent scale effect as it becomes more prominent with its impact on public borrowing. This phenomenon, which directly affects capital efficiency, reveals a significant positive impact on public borrowing.

Keywords Capital Productivity, Export Levels, OECD, Public Borrowing, Ratio of Export to Import

JEL Codes: E63, F34, F43, F63.

1. Introduction

There has been a stagnant effect on investments within the scope of the OECD in recent years and it has been observed that the fiscal effect of the tax burden has also been often agenda. This fact, which means to aim to ensure capital productivity through bringing possible corporate taxes to a more constructive position on the sectors, has gained remarkably importance in recent years for the OECD. But, it appears that the recent increases in public borrowing have an effect that will create a significant level of investment as a correlation effect of foreign debt and domestic debt through government need for more financial resources. In this context, if it is concerned that its demand for more financial resources in recent years, tax burden and capital productivity analyses are inevitable due to the relationships of increasing public debt has also created an essential framework for supporting sectoral investments in terms of cost [1].

It appears that the government borrowing limits in OECD countries have increased at a high level in recent periods, and again, in parallel with the increasing fiscal practices in recent periods, debt increases have resulted in significant capital productivity deviations and financial costs. The most important of these deviations is the negative formation in capital productivity in investments made in response to increased tax burdens. It is observed that the effect of variations in capital efficiency on investment limits has also caused significant investment stagnation among OECD countries recently [2]. Although this phenomenon has been explained by changes in the limits of public borrowing requirements in the analyses made within the framework of its relationship with public debt, it is understood that the fiscal implementations of investment targets are also subject to financial deterrent effects. This concerned phenomenon also creates a stagnation effect on investments due to its negative impact on capital efficiency. Undoubtedly, the changes in government borrowing occur at different levels in all OECD countries. Still, these changes have revealed an extra fiscal deviation efficiency that can express the level of impact of the tax burden, especially within the development levels of the countries in OECD and with an equivalent effect position. In other words, countries with different levels of development in OECD countries have different impact scales on capital efficiency as related to tax burden; these differences create different compelling fiscal effect correlations to support the sectors with the increase in public borrowing as domestic and foreign borrowing [3]. The expression of these correlations, as a ratio of GDP, in the relevant process and as an average value meaningful as it also reveals that the target economic growth limits are not reached in some countries due to being directly related to the tax burden [4]. The differences in the investment target limits directly affect the average public borrowing limits within OECD. Moreover, it is also understood that public borrowing increases are in a correct relationship with the growth rate of countries' GDP that expresses emerging economies within the scope of OECD and the financing requirement depending on this speed [5].

2. Literature Review

One of the significant studies on this matter is the study conducted by Goel and Ram [6] on the effects of investments within the scope of the OECD and the level of financial uncertainty. The study reveals the impact level of publicly funded R&D research on investments and the investments levels affected projectivity in the OECD by the financial practices and interpret the possible future changes. Another study on the recent position of capital efficiency in OECD and analysis of investments is the OECD's [7] own study. One of the current studies examining capital efficiency from a different perspective within the scope of the OECD is the study by Wang [8]. In the study, which based on the interpretation of productivity gains in industrial sectors, especially in terms of capital efficiency, with empirical findings, the econometric dimension of the relationship between landscaping and capital efficiency has been investigated. Meaningful findings have been forth via empirical correlations regarding the scope of financial costs in changing public financial policies. In the study, important determinations were made regarding the changes in capital efficiency and the evaluation of investments, and possible productivity deviations. Undoubtedly, one of the most recent studies on our subject is the study conducted by Buryk et al. [9] on the global macroeconomic effects of public borrowing and its relation to capital. In the study, the global causes of public borrowing levels were discussed, and an analytical interpretation of the possible macroeconomic effects of the increase in investment rates at the global level in a process where public borrowing also increased, based on OECD countries. An important statistical study on public borrowing and investment increases under the OECD is the study by the OECD [10]. This study has put forth meaningful graphics following the productivity deviations regarding the recent capital increases and their comparable position in public borrowing through recommendations. In addition, AlHares's [11] study is an important study that deals with capital efficiency in the OECD regarding possible capital costs and evaluates public cooperation in terms of possible costs, including public borrowing increases. In this study, a level of mutual influence, where investments and capital efficiency in the OECD have handled public entrepreneurship, has been discussed and it aims to determine empirically and reveal the capital efficiency effects of possible public expenditures [12].

3. Deviations in Investment-Capital Productivity in the OECD Public Debt Growth Process

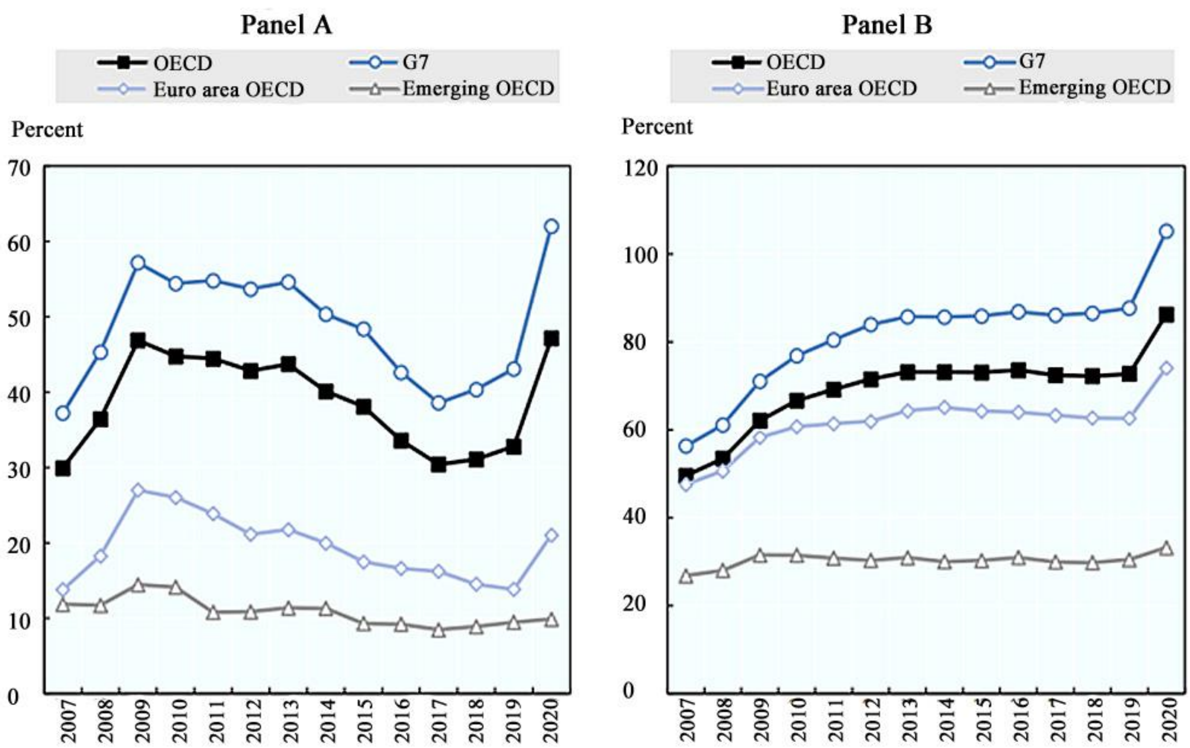
Considering average increases in public borrowing in OECD countries separately from increases in GDP under these countries means including components assessments in investment efficiency in the changing GDP process. However, it is not always possible to talk about absolute increases in investments and capital productivity in every country where there is a positive increase in GDP when viewed with a general average. The effect of GDP on productivity per capita, as investment efficiency, is meaningful and positive [13]. It appears that capital usage costs are one of the main characteristics affecting the possible capital efficiency in emerging economies within the scope of OECD. These concerning costs are not directly expressed in terms of their corresponding values in national income, which means a higher level of effect on the increase of public borrowing [14].

3.1. Real Economic Growth and Global Deviations in OECD Countries in the Process of Public Borrowings

The increase in public borrowing and capital productivity in OECD countries is directly related to GDP changes. This relationship has brought some crucial deviations in response to the increasing GDP in some countries, especially in the OECD Euro Area. As of 2019, the increase in GDP based on countries, especially in OECD countries, frequently brings up some critical deviations regarding capital accumulation and investments as correlation effect values. This situation emphasizes that the increasing GDP supports capital investments directly intended for capital productivity, especially in OECD countries. In other words, the possible productivity changes per capital related to capital investments are revealed through a linear correlation relationship as associated with the changing GDP process, and it is meaningful through this fact. Here, it should emphasize that the structural features of the increases in the average national income of the countries within the scope of OECD differ in countries implementing different currencies and policies [15].

These countries reveal that OECD averages show a growth average close to these averages compared to countries that are not OECD countries but move with a debt multiplier effect with high public borrowing obligations. However, it is not possible to explain that there is not a very high rate of positive scale effects related to borrowing correlations in recent years, with increasing public borrowing costs [16]. On the other hand, despite not being an OECD country, the growth rate of India and China is quite remarkable. In these countries, it appears that the public borrowing limits for 2019 increased in a controlled manner, albeit at a meager rate. Still, the negative effect of the increase in borrowing costs on capital efficiency has turned into a positive process via positive effect correlations in the macroeconomic dynamics and a result output effect like lower public borrowings. On Chart 1 below, it is possible to monitor the real changes in the said public borrowing limits in the last period, the effective percentage values as the debt stock:

Panel A: Gross borrowing as a percentage of GDP **Panel B: Debt stock as a percentage of GDP**



Source: OECD (2020-b), OECD Sovereign Borrowing Outlook 2020, Paris: OECD Publishing, 2020, p. 18. https://doi.org/10.1787/0d1d1e2e-en [17].

* As Percentage of GDP

Chart 1. Changes in Borrowing Tendency and Debt Stocks in OECD Countries

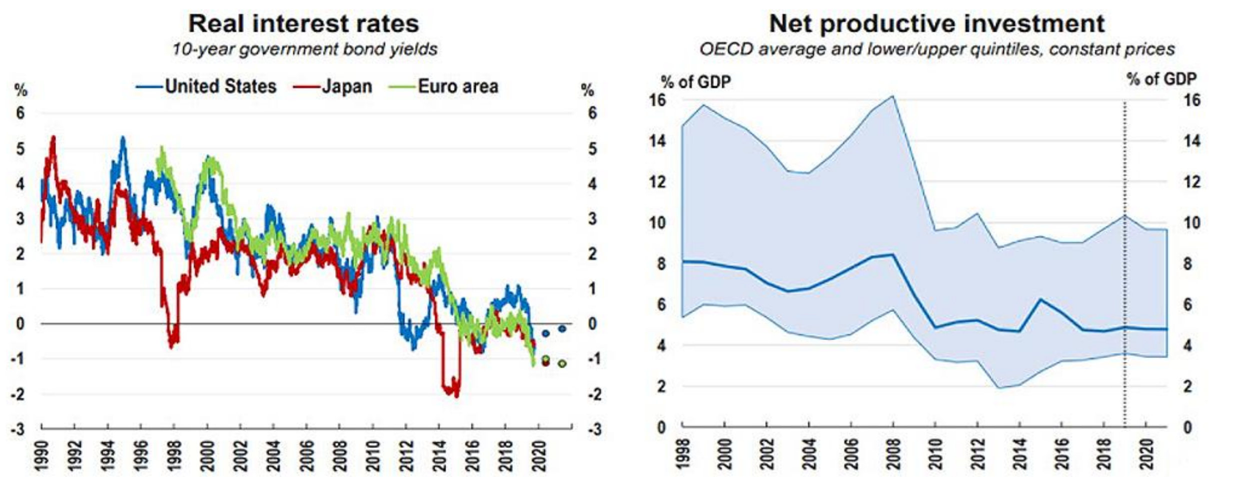
In Chart 1 above, together with the changes in the public debt stocks after 2007, a significant debt borrowings formation emerged. When Panel A and Panel B are compared, it is observed that the tendency of public borrowing, which decreased in 2017 and 2018, especially in OECD countries, continued in a stagnant effect on public borrowing as a debt stock. In brief, there was a significant contraction in countries' economies with the impact of the global pandemic and financial crisis after 2019 and this phenomenon has strengthened the tendency of public borrowing. After the 2008-2009 years as a borrowings period, is noteworthy that there are significant increases. This increase, especially in the G7 countries, is above the rise in public debts in the average OECD countries. On the other hand, despite the stable low borrowing levels within the scope of the controlled borrowing policies followed in the emerging economies, the public borrowing trend after 2019 continued in a very controlled manner 2018.

This phenomenon regarding the controlled continuation of public borrowing in also emerging economies appears to have arisen from the need to control the public borrowing costs that have increased in recent years. Within the Maastricht criteria, OECD member countries, especially emerging economies, felt the need to significantly control their borrowing limits and implement a new debt policy due to the possible global debt costs [18]. In public borrowing, the expression of the issue within Maastricht criteria, which concerns especially the European Union debt limits at the global level and OECD average public debt values, is also essential. [19]. This phenomenon is considered a vital borrowing instrument in public borrowings under the OECD, showing significant changes. Indeed, it means that they have chosen to practice a predominantly contractionary fiscal policy approach intended to narrower public debt stocks, as seen in Chart 1. The volatile nature of the public borrowing limits makes public borrowing policies borrow with different borrowing instruments. Although the increase in interest rates as an investment cost has a significant deviation effect on capital efficiency, it does not have a significant positive effect on public borrowing limits; while the tendency to borrow yearly in recent years has decreased, it does not create a considerable correlation on debt stocks as a ratio of GDP explainable [20].

3.2. Global Position of Public Borrowings and Public Capital Formation in the Process of Borrowing Costs

Variations in public borrowing under the OECD have affected interest rates related to the fluctuations in the monetary capital demand of emerging economies. Still, they did not have a linear effect on the process as a direct investment cost. This structure has revealed a process where the increase and volatility of public debt in the Euro Area directly affected the trend towards the periodic gain of the currency and further weakened the effects of the volatility in interest rates on capital efficiency [21].

In this context, it is understood that the possible public borrowing correlations have put forth a striking significance at the effect level depending on the variability of preferential borrowing policies and fixed capital investments as the OECD average. In this context, the multiplier effect correlations created by the relationship between capital efficiency and GDP in OECD countries make it necessary to question whether it creates an impact scale with public borrowing and undoubtedly includes borrowing costs [22]. This structural phenomenon reveals that public borrowing, as a relationship between productive investments and financial cost correlation in the process and that the variability comparisons of interest rates and net investment efficiency, especially for the post-1990 years, are significantly meaningful. Chart 2 presents the rates of variations in interest rates and net capital investment productivity (as a per cent of GDP) in the OECD and dominant countries:



Source: OECD (2019), OECD Economic Outlook: Database Inventory 106, Database Inventory-Documentation Volume 2019/2, Paris: OECD Publishing, 2019, pp. 41-42 [23].

Chart 2. The Changes in Interest Rates and Impacts on Net Capital Investments as Investment Cost

As seen in Chart 2 above, the average interest rates in the major countries within the OECD and the Euro Area after 1990 have an inevitable downward trend. Still, the effect of this decline in interest rates on capital investment efficiency is observed to be significant via indirect variations and global financial volatility. In other words, although the changes in interest rates decreased globally, especially after 2000, they have not created significant changes in net investment productivity values as a proportion of GDP under the OECD. However, the decreases in net investment productivity, as the average of OECD countries after 2006, followed a more meaningful decrease trend as a proportion of GDP [24].

It is possible to explain this structural reciprocal interaction phenomenon in two ways: Firstly, the fluctuations in the dollar appreciation in global markets after 2000 did not significantly affect investments in OECD countries but also had an indirect effect on public borrowing trends. Secondly, this phenomenon explains the differences in investment efficiency and interest rates, as the values used as currency in the Euro Area are effective, and the differences between currencies have an indirect negative effect on net capital investments [25]. It is not easy to evaluate the increases in public borrowings as an OECD average as absolute Dollar indexed increases in this respect. This approach can also be explained by the fact that public debt stocks, which remain stagnant despite falling interest rate costs, take place in the process of fixed capital formation, especially in advanced OECD countries (OECD, 2020-a). This correlation also reveals that the decrease in investment costs and the increase in public borrowings do not reach the desired level, especially in advanced OECD countries [26].

As a GDP ratio, this reveals that the correlation effect between capital productivity and GDP is negatively related to the capital formation process. Again, at this stage, the significant increase in public fixed capital increases within the scope of the OECD after the 2009 financial crisis has been an essential factor in overcoming the process of the financial crisis [27]. As a proportion of GDP, the increase in fixed capital investments is considered a phenomenon that causes the stagnant course of public borrowing limits with its positive effect on economic growth balances and is an important factor in maintaining a positive correlation of public borrowing effects with GDP. But, despite increasing global borrowing costs, this fiscal process has no prevented the deflection of the fixed capital formation after 2010 and its next years, even if it is interpreted positively for government debt rates [28] [29] [30].

4. Empirical Model Approach

As the empirical model, we chose in our study, we could present our preference for the regression model in which the independent variables are included to determine the effect values on the dependent variable, including the dummy residual variables. Besides the empirical regression model, we express the relationship between dependent variable values and residuals in that model with the sense of "H_0" and "H_1" values in a structure where alternative hypotheses investigate the existence of a model institution error related to meaningful analyses:

$$Y_i = \beta_0 + \beta_1 X_i + \beta_2 \hat{Y}_i^2 + \beta_3 \hat{Y}_i^3 + u_i \tag{1}$$

$$H_0: \beta_2 = \beta_3 = 0$$

$$H_1: \beta_2 \neq \beta_3 \neq 0$$

It is possible to express the corresponding symbol expressions of the values expressed as dependent and independent variables in our regression model and their meaning in the model as in Table 2 below:

4.1. Establishing and Testing the Econometric Model

It is possible to write our regression equation for the relevant time series model within the framework of our ARDL –Auto-Regressive Distributed Models- regression equation as follows:

$$\begin{aligned} \Delta y_t = {} & c_0 + c_1 t + \pi_{yy} y_{t-1} + \pi_{yx \cdot x} x_{t-1} \\ & + \textstyle\sum_{i=1}^{p-1} \psi_i \Delta z_{t-i} + \omega' \Delta x_t + \theta w_t + u_t \end{aligned} \tag{2}$$

Long Term Multipliers (t = *trend variable*):

$$\Rightarrow \pi_{yy} \text{ ve } \pi_{yx \cdot x} \qquad Z_t = (y_t, x_t)'$$

It is possible to write the derivative of the ARDL model, which we expressed in the above equation (2), as total effect variables addressed in each other for our study like below:

$$\mathrm{Y_t} = \beta_0 + \textstyle\sum_{i=1}^{m} \beta_{1i} \mathrm{Y_{t-i}} + \sum_{i=0}^{n} \beta_{2i} \mathrm{X_{t-i}} + \mathrm{e_t} \tag{3}$$

Hypothesis criteria for cointegration between covariates:

$$H_0: \pi_{yy} = 0, \pi_{yx \cdot x} = 0'$$

$$H_1: \pi_{yy} \neq 0, \pi_{yx \cdot x} \neq 0'$$

Again, in this framework, the effect levels of these model error coefficients in the independent scale values that make up our model and the long-term delay coefficients of the variables in our model are important. Within the framework of our ARDL model, we express the analytical suffix scale determinations of the Error Coefficient Terms, which also rationalize the long-term effect scales of the variables, with the following equation:

$$\begin{aligned} \Delta \mathrm{Y_t} = {} & \beta_0 + \sum_{i=1}^{m} \beta_{1i} \Delta \mathrm{Y_{t-i}} + \sum_{i=0}^{n} \beta_{2i} \Delta \mathrm{X_{t-i}} + \\ & + \beta_3 \mathrm{ECT_{t-1}} + \mathrm{e_t} \end{aligned} \tag{4}$$

We can express the corresponding meanings of the symbolic spellings of the dependent and independent variables in the model as the corresponding meanings in Table 1 below:

Table 1. Meanings Modelling of Dependent and Independent Components in The Econometric Model

GOV_DEBT	Average Government Debt to GDP for OECD
INVSTM	Average Changes in Investment Rates for OECD
CAPITAL PRODUCT	Capital Productivity as percent of GDP for OECD
VY	Average Tax Burden for OECD
GDP	Changes Rates of GDP as per cent for OECD

Within the framework of the ARDL mentioned above model, it is possible to construct our model with an equivalent approach intended to the determinations aimed in our study and the effect levels of the periodical lagged years as follows:

Estimation Equation:

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```
GOV_DEBT = + C(1)*GOV_DEBT(-1) + C(2)*GOV_DEBT(-2)
           + C(3)*INVSTMFARK
           + C(4)*CAPITALPRODUCT + C(5)*CAPITALPRODUCT(-1)
           + C(6)*VY
           + C(7)*GDP + C(8)*GDP(-1) + C(9)*GDP(-2) + C(10)*GDP(-3)
           + C(11)
```

To ensure stationarity in all series, first-order differences were taken, the time series whose differences were taken subjected to the Augmented Dickey-Fuller Test (ADF) and Phillips-Perron test, and thus the stationarity of the series was tested. It was preferred to determine the results of ADF and Phillips-Perron tests for unit root tests within the following analytical equations framework, including lag values:

Augmented Dickey-Fuller Test (ADF):

$$\Delta Y_t = \alpha_0 + \rho Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_t$$
$$\Delta Y_t = \alpha_0 + \beta t + \rho Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_t \quad (5)$$

Phillips-Perron Test Analitically [31]:

$$\tau_\delta = \mathrm{t}_\delta \left(\frac{\gamma_0}{\mathrm{f}_0}\right)^{1/2} - \frac{\mathrm{T}(\mathrm{f}_0-\gamma_0)(\mathrm{se}(\hat{\delta}))}{2\mathrm{f}_0^{1/2}\mathrm{s}} \quad (6)$$

Unit Root Test analysis values within the scope of Augmented Dickey-Fuller Test Statistic (ADF) and Phillips-Perron Test Statistic applications are shown in Table 2.

As seen in Table 2, to test the stationarity of the dependent and independent variables in our model, the unit root test was performed, and it appeared that the sequences were not stationary. Because the T-statistical values of the variables at the fixed level were lower than the test critical values level of significance. Thus it was accepted to use the first-order differenced series to ensure the stationarity series. On the other hand, in determining the accuracy of the variables of our model, it is possible to see the probability values of the unit root tests as related to other the summary values together with the standard deviations within the scope of both test methods in Table 3.

Table 2. Testing the Stability of Variables in the Model: Unit Root Analysis

Variables	Augmented Dickey-Fuller Test Statistic				Phillips-Perron Test Statistic			
	Fixed Values		First Differences		Fixed Values		First Differences	
	T-Statistic	Test Critical Values*	T-Statistic	Test Critical Values*	T-Statistic	Test Critical Values*	T-Statistic	Test Critical Values*
GOV_DEBT	-2.974702	-3.544284	-6.718716	-3.548490	-3.018313	-3.540328	-7.515415	-3.544284
INVSTM	-1.140093	-3.540328	-7.832800	-3.540328	-0.979497	-3.540328	-7.826777	-3.540328
CAPITAL PRODUCT	-3.909664	-3.540328	-9.949563	-3.540328	-2.909596	-3.540328	-36.32273	-3.540328
VY	-1.882453	-3.557759	-5.455954	-3.552973	-2.453615	-3.548490	-5.563971	-3.552973
GDP	-3.099516	-3.540328	-6.571214	-3.544284	-3.008918	-3.540328	-23.08811	-3.540328

***** As based on > 0.05 significance criterion

Table 3. Group Unit Root Test: Summary*

Series**: GOV_DEBT; INVSTM; CAPITAL PRODUCT; VY; GDP
Sample: 1983 2019

Method	Statistic		Prob.**	Sections	Obs	Prob.**
Levin, Lin & Chu t*	-15.5308		0.0000	5	174	0.0000
Im, Pesaran and Shin W-stat	-14.6935		0.0000	5	174	0.0000
ADF - Fisher Chi-square	143.145		0.0000	5	174	0.0000
PP - Fisher Chi-square	119.701		0.0000	5	176	0.0000
Coefficient (ADF)***	-1.316238 (0.195906)	-1.316238 (0.165347)	-1.316238 (0.150758)	-1.316238 (0.176399)	-1.316238 (0.269956)	0.0000
Coefficient (Phillips-Perron)***	-0.843284 $(-0.843284)^t$	-0.843284 $(-1.295128)^t$	-0.843284 $(-1.499976)^t$	-0.843284 $(-0.962423)^t$	-0.843284 $(-1.295322)^t$	0.0000

* Automatic lag length selection based on SIC: 0 to 1 Unit root (assumes common unit root process)

** All tests assume asymptotic normality

*** Standard deviations in bracketed (t)

4.2. Testing the Model and Analysis of the Accuracy Coefficients

To test the significance and accuracy of our model, as Selected Model: ARDL- Auto-Regressive Distributed Models (2, 0, 1, 0, 3), firstly, the Serial Correlation LM test was performed, and the results were followed as follows:

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.239917	Prob. F(2,19)	0.7890
Obs*R-squared	0.788236	Prob. Chi-Square(2)	0.6743

According to our findings in the above Serial Correlation LM test, the non-correlation hypothesis regarding the two (2) lagged results of the F-statistic cannot be rejected. The fact that the cointegration absence position could not be rejected in our list above gained meaning with the F-statistics values greater than “0.05” (>0.05) and made the model meaningful. In summary, the null hypothesis, which expresses constant variance, cannot be rejected and therefore, there is no problem related to changing variance in the model as an auto-correlation issue.

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.499232	Prob. F(10,21)	0.8715
Obs*R-squared	6.146212	Prob. Chi-Square(10)	0.8028
Scaled explained SS	4.721802	Prob. Chi-Square(10)	0.9090

In addition, as a result of F-statistic values greater than “0.05” (>0.05) in the Heteroskedasticity Test: Breusch-Pagan-Godfrey test, the null hypothesis regarding whether there is cointegration cannot be rejected within the framework of constant variances.

Besides, the applied Ramsey RESET test to test whether the model has a specification error for the ARDL (2,0,1,0,3) model as follow:

Ramsey RESET Test

	Value	df	Probability
t-statistic	0.700206	20	0.4919
F-statistic	0.490288	(1, 20)	0.4919
F-Test Summary	Sum of Sq.	df	Mean Squares
Test SSR	0.990461	1	0.990461
Restricted SSR	41.39365	21	1.971126
Unrestricted SSR	40.40319	20	2.020159

The Ramsey RESET test results above concluded that there was no specification error since the F-statistic value was greater than “0.05” (>0.05). Therefore, it evaluated that in the stationary structure of the model, empirical values are significant because there is no specification error.

In addition, the CUSUM of Square test was used to test the distribution of the residual values of the model, and it was understood that the values found with the Square approach regarding the distribution of the expected distribution values of the model in a meaningful frame are significant in Chart 4:

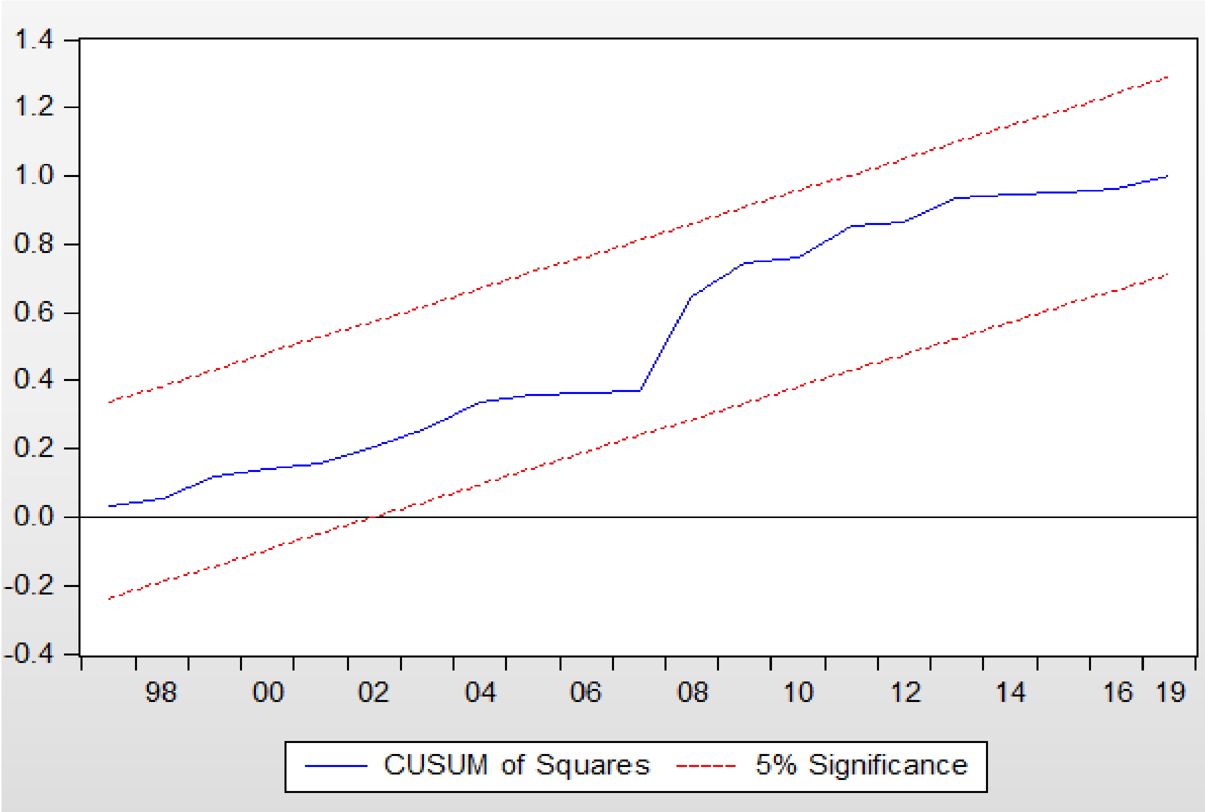

Chart 4. Significance Distribution of the residual and co-integrity values of the CUSUM of Square model (As >0.05)

As seen in Graph 4, it appears that the CUSUM of Square test within the scope of Recursive Estimates put forth that there is an equivalent meaningful residual efficiency distribution for greater "0.05" (>0.05) criterion measures. This determinative finding reveals that the distribution of variables in the corresponding equivalence model is also significant concerning the outcome effect scales.

5. Empirical Findings

Within the framework of our empirical model, our findings were primarily aimed at determining the lower and upper critical values within the scope of the F-statistics test, including the error coefficients of our model. Compared with the number of observations in our model, the lower and upper criterion values have significant effect criteria. In addition, our findings' lower and upper values also reveal the significant limitations of the effect scale in the model. It is possible to see the position of the lower and upper critical values of the constraints of our model, as determined by the F-statistics in Table 4:

Table 4. Detection of Long-Term Effects and Critical Values in F-statistic Values

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.861877	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06
Actual Sample Size	32		Finite Sample: n=35	
		10%	2.696	3.898
		5%	3.276	4.634
		1%	4.59	6.368
			Finite Sample: n=30	
		10%	2.752	3.994
		5%	3.354	4.774
		1%	4.768	6.67

At this stage, as seen in Table 4, the F-statistic values are above the lower and upper critical values. These effect constraints in the model are with an effective scale of "3.276" as the smallest value and "4.634" as the highest value based on "0.05" significant have effect criteria determined. On the other hand, the long-term effects of the independent variables in the model on the dependent variable reveal meaningful interpretations with their significant results. Table 5 shows the long-term effects of independent components on the dependent variable in the model:

Table 5. Long-term Impact Scale Values of the Components

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INVSTM	0.291517	0.226872	1.284939	0.0028
CAPITAPRODUCT	-7.98E-05	5.14E-05	-1.551507	0.0057
VY	-0.717456	0.704416	-1.018511	0.0002
GDP_	-2.174603	0.674910	-3.222065	0.0041

EC = GOV_DEBT - (0.2915*INVSTM -0.0001*CAPITAL PRODUCT
-0.7175*VY -2.1746*GDP)

As seen in Table 5, it appears that a 1 (a unit) increase in average investments within the scope of OECD causes an accumulation of around "0.291" in average public debt limits. Thus, it is observed that public borrowing limits are indirectly negatively affected by an increased effect, albeit indirectly, from average OECD investments. On the other hand, it has emerged that each unit increase in Capital Product, Tax Burden, and OECD average GDP has a reducing effect on public borrowing limits as OECD average. It is seen that the most significant and striking deviation-decrease in the average public borrowing limits as the OECD average is due to Capital Efficiency. It is understood that the increase in capital efficiency-CAPITAL PRODUCT 1 (Unit)-unit has created a shrinking effect in public borrowing limits around "-7,988". Besides, it reveals that as an OECD average, 1 (Unit) increase in GDP creates a significant shrinking effect on public borrowing limits, and this shrinkage effect is around "-2,174".

In addition, we see that the effect scales on the dependent variable, which can be expressed with a lagged approach covering the following years as annual periods in the model, are determined as follows, with the different effect values determined. Thus, these values in Table 6 below are substitutable impact scale values covering subsequent periods based on years:

Table 6. Substitutable Impact Scale Values in Future Periods*

GOV_DEBT =	+ 0.4337234*GOV_DEBT(-1) - 0.6110317*GOV_DEBT(-2)
	+ 0.3432053*INVSTM
	- 4.482390e-05*CAPITAPRODUCT- 4.908891e-05*CAPITAPRODUCT(-1)
	- 0.8446664*VY
	- 0.6771285*GDP- 0.9545071*GDP(-1) - 0.0347549*GDP(-2) - 0.8937875*GDP(-3)
	- 0.296407189166

*As Years

It is more explanatory and realistic to interpret the above Table 6, the ratio of the public borrowing limits that is a dependent component to GDP together with the standard deviations and other structural effects determined within the meaningful framework of the t-statistic and probable values. Thus, Table 7 below presents a meaningful holistic structure of the scale effects expressed as coefficients in Table 6, together with their standard deviation and probability values:

Table 7. The Short-Term Distribution of Periodic Impact Scales throughout Statistical Values

Variable*	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
GOV_DEBT $_{(\Delta t-1)}$	0.433723	0.171117	2.534662	0.0193
GOV_DEBT $_{(\Delta t-2)}$	-0.611032	0.200989	-3.040118	0.0062
INVSTM	0.343205	0.261446	1.312720	0.0034
CAPITAPRODUCT	-4.48E-05	3.54E-05	-1.265085	0.0197
CAPITAPRODUCT $_{(\Delta t-1)}$	-4.91E-05	3.28E-05	-1.495716	0.0496
VY	-0.844666	0.753426	-1.121101	0.0149
GDP	-0.677129	0.234277	-2.890285	0.0088
GDP $_{(\Delta t-1)}$	-0.954507	0.294038	-3.246204	0.0039
GDP $_{(\Delta t-2)}$	-0.034755	0.390451	-0.089012	0.0299
GDP $_{(\Delta t-3)}$	-0.893788	0.380370	-2.349785	0.0286
R-squared	0.791125		Prob.	0.00003
Adjusted R-squared	0.691661		F-statistic	7.95388

* Sample (adjusted): 1981 2019, as array series values taken as a percentage of GDP

Table 8. Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GOV_DEBT$_{(\Delta t-1)}$)	0.611032	0.160323	3.811257	0.0010
D(CAPITAPRODUCT)	-4.48E-05	1.73E-05	-2.590459	0.0171
D(GDP)	-0.677129	0.138579	-4.886242	0.0001
D(GDP$_{(\Delta t-1)}$)	0.928543	0.410182	2.263732	0.0343
D(GDP $_{(\Delta t-1)}$)	0.893788	0.281571	3.174287	0.0046
CointEq(-1)*	-1.177308	0.172100	-6.840825	0.0000
R-squared	0.876013	F-statistic		29.43903
Adjusted R-squared	0.846256	Prob(F-statistic)		0.000000

As can be seen in table 7, increases in average public debt within the scope of OECD are exposed to "0.4337" increase effect level in the short term; based on the second year, and it is observed that it has a shrinkage effect equivalent to unit values as "-0.6110" as the mean effect scale of all independent variables. The effect level of the independent variables causes an increase of "0.3432" for each unit increase with their short-term effects on the average of investments within the scope of OECD. However, the effect of this increase cannot be interpreted as a short or long-term effect. This determination reveals that each possible increase in investments for the coming years has an increasing effect on public borrowings by at least the effect value of "0.3432" as the lower limit. Again, in this framework, it is seen that capital efficiency and tax burden variability, which are independent variables, have a decreasing effect on average public debt as a percentage of short-term GDP. Moreover, it is understood that this effect has a significant shrinking effect on public borrowing in the short term, especially with the lower limit of "-4.48" and the upper limit of "-4.91" based on capital efficiency. The effect value of the OECD average tax burden, on the other hand, reveals a shrinking effect of around "-0.8446" in public borrowing, in parallel with the positive increase in the taxes collected for each year. It is understood that the contractionary effect in public borrowing as average variability, as the average of GDP, continues a contraction effect with possible positive increases in GDP in the short and medium-term as related to the next years. However, especially for each one unit (unit) increase in GDP in the first year, it is seen that it creates a shrinking effect around "- 0.6771" as the lower value and "-0.9554" and "-0.8937" as the average upper. This effect of the scale of the positive impact in increases of GDP can be explained by the fact that the model creates a significant positive provisioning effect versus borrowings during periods when marginal proportional increases in GDP are higher than increases.

Error correction model and short-term deviation correction efficiency:

Determining the error correction coefficient in the model is essential in giving information about the period in which the deviations in the effect scale of the independent variables will provide a meaningful equilibrium state in the long term. In this framework, the t-statistic values should be determined related to error correction regression and then interpreted with lower and upper coefficient values. Table 8 put forth the concerned matters:

As seen in Table 8, the Error Correction Coefficient value for correcting the deviations caused by the short-term effects of the variables in the model and interpreting its effectiveness in the determinations of the model with valid values was determined. This coefficient has been compared with the t-statistic values in Table 9 to aim at the determined effectiveness criteria effect below:

Table 9. The Detected T-Bounds Test Values and Critical Values

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-6.840825	10%	-2.57	-3.66
		5%	-2.86	-3.99
		2.5%	-3.13	-4.26
		1%	-3.43	-4.6

The critical values of the t-statistic values determined in Table 9 above, which are the lower and upper limits, are lower in absolute value than the Error Correction Coefficient value determined in Table 7, thus revealing that the Error Correction Coefficient value is significant. Therefore, for example, the Error Correction Coefficient value in Table 7 is “-1.17730”. The value found by dividing the value of “-1.17730” by 1 (one) as "0.8534" means that the possible deviations in the effect level of the independent impact scales in the short term will reach the equilibrium point in "0.8534" as annual. In other words, the probable economic deviation imbalances will get the desired sustainable balance levels at "about eight months" as a yearly time frame.

6. Conclusion

It is observed that the recent increases in public borrowing limits, as the OECD average, are affected by some critical macro sub-dynamics, and these dynamics, with their positive and negative effects, cause significant changes in public borrowing. The fact that the GDP growth rates, as the average of OECD countries, form a directly meaningful structure on public borrowings highlights the average national income values as an essential effect dynamic. However, as the OECD average, it is seen that the changes and positive increases in investment rates create an increase in public borrowing limits because of possible costs on public borrowing limits. On the other hand, it appears that financial facts such as tax burden have a decreasing effect on public borrowing limits due to changes in average fiscal impact values. This phenomenon can be explained by a structural change process in the public revenues are constantly increasing based on the continuous increase in tax revenues. When this increase in OECD average Tax Burdens, where there is a contraction effect above the public borrowing limits, is evaluated together with capital efficiency, it also reveals a significant balance process that creates a mutual contraction effect on public borrowings for the short term. The issue that should emphasize in the determinations is that, as an OECD average, one of the independent variables, capital productivity, significantly affects the average public borrowing limits. However, it should be emphasized that this increase in capital productivity can also be explained by the incentives for short-term capital investments and the stimulation of rational investments to increase productivity by the GDP level. Indeed, in the short run, increases in national income as GDP have had significant effects, albeit small, and have created a decrease in public borrowing limits, indirectly affecting OECD average capital productivity. In brief, the possible costs related to investments from the independent components, the other three independent variables are OECD average tax burden, OECD average GDP, and OECD average investments variables, in the long run, have a reducer effect on public borrowing limits. Yet, significantly, capital productivity increases in the employment limits created by the investments and the deviations in the monetary values gained by global trade have created a rise in the OECD average public borrowing limits in the long run. In this framework, it is understood that the increases in public borrowing limits will continue in the coming periods as the OECD average. The increasing financing needs of the especially the OECD member countries representing emerging economies that affect this increase will be effective in this.

Annex 1

Table Annex 1. Effect Values of Cointegrating Equation

D(GOV_DEBT) = -0.296407189166 -1.177308319542*GOV_DEBT (-1)
+ 0.343205374178*INVSTM
-0.000093912814*CAPITAPRODUCT(-1) -0.844666448012*VY
-2.560178210697*GDP(-1)
+ 0.611031722334*D(GOV_DEBT(-1))
-0.000044823903*D(CAPITAPRODUCT)
-0.677128585857*D(GDP)
+ 0.928542506719*[GOV_DEBT -(0.29151699*INVSTM(-1)
-0.00007977*CAPITAPRODUCT (-1) -0.71745560*VY(-1)
-2.17460301*GDP(-1)) + 0.893787522067*D(GDP(-2))]

Annex 2

Table Annex 2. The Distribution of Histogram Normality Test Values

Mean	139e-17
Median	-0.073916
Maximum	2.574599
Minimum	-3.463418
Std. Deviation	1.155543
Skewness	-0.195572
Kurtosis	4.567727
Jarque-Bera	3.481014
Probability	0.175431

Annex 3

Table Annex 3. Correlogram Squared Residuals Values

Sample: 1981 2019

Included observations: 41

<table>
<tr><th>Autocorrelation</th><th>Partial Correlation</th><th></th><th>AC</th><th>PAC</th><th>Q-Stat</th><th>Prob*</th></tr>
<tr><td>. | . |</td><td>. | . |</td><td>1</td><td>-0.027</td><td>-0.027</td><td>0.0254</td><td>0.873</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>2</td><td>-0.089</td><td>-0.090</td><td>0.3128</td><td>0.855</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>3</td><td>-0.077</td><td>-0.083</td><td>0.5342</td><td>0.911</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>4</td><td>-0.109</td><td>-0.125</td><td>1.0000</td><td>0.910</td></tr>
<tr><td>.**| . |</td><td>.**| . |</td><td>5</td><td>-0.208</td><td>-0.240</td><td>2.7468</td><td>0.739</td></tr>
<tr><td>. |* . |</td><td>. |* . |</td><td>6</td><td>0.162</td><td>0.115</td><td>3.8430</td><td>0.698</td></tr>
<tr><td>. |* . |</td><td>. |* . |</td><td>7</td><td>0.143</td><td>0.101</td><td>4.7363</td><td>0.692</td></tr>
<tr><td>. |* . |</td><td>. |* . |</td><td>8</td><td>0.115</td><td>0.116</td><td>5.3310</td><td>0.722</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>9</td><td>-0.112</td><td>-0.114</td><td>5.9222</td><td>0.748</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>10</td><td>-0.029</td><td>-0.021</td><td>5.9646</td><td>0.818</td></tr>
<tr><td>. | . |</td><td>. |* . |</td><td>11</td><td>0.066</td><td>0.169</td><td>6.1906</td><td>0.860</td></tr>
<tr><td>. |* . |</td><td>. |* . |</td><td>12</td><td>0.120</td><td>0.204</td><td>6.9732</td><td>0.859</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>13</td><td>-0.079</td><td>-0.069</td><td>7.3337</td><td>0.884</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>14</td><td>0.032</td><td>-0.064</td><td>7.3949</td><td>0.918</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>15</td><td>-0.052</td><td>-0.034</td><td>7.5677</td><td>0.940</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>16</td><td>-0.181</td><td>-0.097</td><td>9.8055</td><td>0.877</td></tr>
</table>

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