# ECONOMETRIC ANALYSIS OF THE RELATIONSHIP BETWEEN PUBLIC CONSUMPTION EXPENDITURES AND ECONOMIC GROWTH FOR THE PERIOD 1960-2021 FOR TURKIYE

## *1960-2022 DÖNEMİ KAMU TÜKETİM HARCAMALARI İLE EKONOMİK BÜYÜME İLİŞKİSİNİN TÜRKİYE İÇİN EKONOMETRİK ANALİZİ*

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**ABSTRACT**

The study aims to analyze the relationship between public consumption expenditures and economic growth for the period of 1960-2021 for Turkiye. The data used in the analysis were obtained from the World Bank website. While the study was being carried out, first of all, literature research on the subject was conducted. After the literature review, public consumption expenditures and GDP data for Turkey for the period 1960-2021 were obtained from the World Bank Data Bank website. For the aforementioned data, unit root tests were performed with Eviews and Todo Yamamoto analysis was applied. Considering the chi-square test statistic and probability values, causality from GDP variable to public consumption expenditures has been determined. The causality relationship could not be determined from public consumption expenditures to the GDP variable. It has been seen that an increase in economic growth is not possible with an increase in public consumption expenditures. However, with the economic growth, public consumption expenditures increase for the relevant period.

**Keywords:** Public Consumption Expenditures, Economic Growth, GDP, Todo Yamamoto

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**ÖZ**

Çalışmanın amacı Türkiye açısından 1960-2021 dönemi için kamu tüketim harcamaları ve ekonomik büyüme arasındaki ilişkinin analiz edilmesidir. Analizde yararlanılan veriler Dünya Bankası web sayfasından temin edilmiştir. Çalışma gerçekleştirilirken öncelikle konuya ilişkin literatür araştırması yapılmıştır. Literatür araştırmasının ardından Türkiye için 1960-2021 dönemi kamu tüketim harcamaları ve GSYH verileri Dünya Bankası Veri Bankası internet sayfasından temin edilmiştir. Söz konusu veriler için Eviews ile birim kök testleri yapılarak, Todo Yamamoto analizi uygulanmıştır. Ki-kare test istatistiği ve olasılık değerleri dikkate alındığında GSYİH değişkeninden kamu tüketim harcamalarına doğru nedensellik tespit edilmiştir. Kamu tüketim harcamalarından GSYH değişkenine ise nedensellik ilişkisi tespit edilememiştir. Kamu tüketim harcamalarının artırılması ile ekonomik büyüme artışının mümkün olmadığı görülmüştür. Ancak ekonomik büyüme ile birlikte kamunun tüketim harcamaları ilgili dönem için artış göstermektedir.

**Anahtar Kelimeler:** Kamu Tüketim Harcamaları, Ekonomik Büyüme, GSYİH, Todo Yamamoto

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## Econometric Analysis of the Relationship between Public Consumption Expenditures and Economic Growth for the Period 1960-2021 for Turkey

### Introduction

Today, the GDP value is used as a growth criterion for econometric analysis in the measurement of growth. Ensuring sustainable economic growth is among the most important macroeconomic goals of countries. Especially growth rates and speeds are extremely important for developing countries. Various economic policies are implemented for the sustainability of economic growth. In line with these policies, the activities of the public sector are shaped. In this context, public consumption expenditures to finance the public interest also have an important place in the economic movements of the states. Although the relationship between public expenditures and economic growth began to be studied extensively in the post-World War II years, it still maintains its importance today. Especially in terms of developing countries such as Turkiye, the rate and rates of economic growth and whether public expenditures affect economic growth have been the subject of many studies. The size of the public sector and the state of public finance deficits are extremely important in terms of macroeconomic structure for all developed countries, including Turkiye.

The main questions of these studies are whether public expenditures increase as a result of economic growth or whether there is an increase in public expenditures for economic growth. In studies carried out in this direction, Wagner Hypothesis and Keynesian approach were generally compared. The Wagner hypothesis explains the long-term change in public expenditures concerning income and displays a demand-side approach (Durevall & Henrekson,, 2011, p. 719)

Wagner's Law suggests that public spending is affected by economic growth. In other words, as national income increases, public expenditures also increase. In the Keynesian approach, if public expenditures increase, economic growth is positively affected and the so-called multiplier mechanism operates. Accordingly, a one-unit increase in public expenditures causes a higher increase in national income than a one-unit increase. Based on the Wagner Hypothesis and Keynesian Approach, which are accepted as basic views, in this study, the relationship between public expenditures and economic growth is discussed.

The period 1960-2020 is the preferred period for Todo Yamamoto Analysis. In the study, the data obtained as a result of the Todo Yamamoto Analysis were evaluated by including the literature covering the analyzes carried out in the past periods.

### 1. Literature

The study of Adolph Wagner is considered to be a pioneering study in terms of the relationship between public expenditures and economic growth. He argued that economic development would also bring an increase in public economic activities and public expenditures (Aksoy, 1991) The study, which took place in the literature as the Wagner hypothesis, was later tested with many empirical studies. Landau (1986) examined the relationship between economic growth and public expenditures using the least squares method for 27 countries. As a result of the study, a unidirectional causality relationship was determined between economic growth to public expenditures. In the table below, there are empirical studies that test the relationship between public expenditures and economic growth and the results obtained from these studies.

**Table 1:** *Literature Review*

| Author | Scope | Term | Method | Result |
|---|---|---|---|---|
| Yamak and Küçükkale (1997) | Turkiye | 1950- 1994 | Cointegration and causality testing | One-way causality from growth to public expenditures has been determined. |
| Ghali (1999) | 10 OECD Countries | 1970:Q1-1994:Q3 | Vector Error Correction Model | It has been determined that public expenditures have a positive effect on economic growth. |
| Kolluri and others. (2000) | G7 Countries | 1960- 1993 | Panel cointegration and causality testing | It has been determined that public expenditures increase economic growth. |

| | | | | |
|---|---|---|---|---|
| Bakırtaş (2003) | Turkiye | 1983- 2000 | causality testing | A bidirectional relationship was found between public expenditures and growth. |
| Angelopoulos and others. (2007) | 23 OECD Countries | 1970-2000 | Regression Test | It has been concluded that efficient public expenditures lead to higher economic growth. |
| Bağdigen and Beşer (2009) | Turkiye | 1950-2005 | Granger causality testing, Hsiao, Todo-Yamamoto causality testing | A causal relationship has been identified. |
| Gül and Yavuz (2011) | Turkiye | 1963-2008 | Unit Root Test, Cointegration Test, Granger Causality Test | A cointegration relationship has been determined between economic growth and public expenditures, investment, and current and transfer expenditures. A one-way causality relationship has been determined from public expenditures, investment, and current and transfer expenditures to economic growth. |
| Gangal and Gupta (2013) | India | 1998- 2012 | Unit Root Test, Cointegration Test, Granger Causality Test | A positive relationship and causality were determined between economic growth and public expenditures in the long run. |
| Ergen and Yavuz (2017) | Turkiye | 1980-2016 | ARDL Cointegration and Granger Causality Analysis | While ARDL cointegration analysis determined a long-term relationship between public expenditure and economic growth, one-way causality from public expenditure to economic growth was determined by Granger Causality Test. |
| Kamacı andKılıç (2019) | 17 OECD Countries | 1996-2015 | Panel Causality Analysis | A bidirectional causality relationship was found between public expenditures and growth and unemployment. |
| Ahuja and Pandit (2020) | 59 Developing Country | 1990-2019 | Fixed Effects Model | It has been determined that public expenditures have a positive effect on economic growth. |
| Bağcı (2022) | 7 Upper middle-income European and Central Asian Countries | 1988-2017 | Panel ARDL | public final consumer spending and public health positive direction from spending to economic growth a relationship has been identified. |

## 2. Method

GDP (current US$)

General government final consumption expenditure (current US$)

Models that state that a time series has the effect of past shocks and/or random shocks in the data generation process is incomplete when studied with real data. Because time series data is affected by the changes of other series as well as past and/or random shocks. Therefore, multivariate analyzes should be performed instead of univariate analyzes. In models with more than one time series, models should be built with a system of equations instead of an equation. For this purpose, vector autoregressive VAR(p) models, which are generalized, are used instead of autoregressive AR(p) models (Sevüktekin. & Çınar, 2017, p. 495).

### 2.1. Toda-Yamamoto Causality Test

Various tests are performed to determine the relationships between the variables. In these tests, whether the series is stationary or not may be a prerequisite for the models. In the Toda-Yamamoto model, while the analyzes are performed at the stationarity level of the series, the analysis is performed with the series itself, regardless of which order it is stationary. Therefore, the series can be used whether they are cointegrated or not. Each variable is considered the dependent variable and the model is estimated as much as the number of variables.

$$y_t = \delta_1 + \sum_{i=1}^{k+d\,max} \alpha_{1i} y_{t-i} + \sum_{j=1}^{k+d\,max} \beta_{1j} x_{t-j} + \varepsilon_{1t}$$

$$H_0: \beta_{1j} = 0 \qquad H_1: \beta_{1j} \neq 0$$

$$x_t = \delta_2 + \sum_{i=1}^{k+d\,max} \alpha_{2i} x_{t-i} + \sum_{j=1}^{k+d\,max} \beta_2 y_{t-j} + \varepsilon_{2t}$$

$$H_0: \beta_{2j} = 0 \qquad H_1: \beta_{2j} \neq 0$$

**Table 2:** *Descriptive Statistics of Variables*

| | Mean | Median | Max | Min | Standard deviation | Skewness | Kurtosis | Normality |
|---|---|---|---|---|---|---|---|---|
| LnFinal | 10.14 | 10.20 | 11.12 | 8.87 | 0.71 | -0.10 | 1.76 | 4.03(0.13) |
| LnGdp | 11.08 | 11.14 | 11.98 | 9.90 | 0.64 | -0.18 | 1.82 | 3.91 (0.14) |

**Note:** *The value in parentheses is the probability value.*

$H_0$ = Has a unit root

$H_1$ = There is no unit root. The series is stationary.

**Table 3:** *Results of Unit Root Tests*

| LnFinal | ADF | | PP | | KPSS | |
|---|---|---|---|---|---|---|
| | Fixed | Fixed and Trending | Fixed | Fixed and Trending | Fixed | Fixed and Trending |
| Test Statistics | -1.70 | -3.23 | -0.86 | -2.41 | 0.96 | 0.05 |
| 1% | -3.54 | -4.12 | -3.54 | -4.11 | 0.73 | 0.21 |
| 5% | -2.91 | -3.48 | -2.91 | -3.48 | 0.46 | 0.14 |
| 10% | -2.59 | -3.17 | -2.59 | -3.17 | 0.34 | 0.11 |

| LnGDP | ADF | | PP | | KPSS | |
|---|---|---|---|---|---|---|
| | Fixed | Fixed and Trending | Fixed | Fixed and Trending | Fixed | Fixed and Trending |
| Test Statistics | -0.70 | -2.33 | -0.70 | -2.66 | 0.96 | 0.09 |
| 1% | -3.54 | -4.12 | -3.54 | -4.11 | 0.73 | 0.21 |
| 5% | -2.91 | -3.48 | -2.91 | -3.48 | 0.46 | 0.14 |
| 10% | -2.59 | -3.17 | -2.59 | -3.17 | 0.34 | 0.11 |

As seen in Table 3, public consumption expenditures and GDP variables have been determined with unit roots.

**Table 4:** *Linear Unit Root Tests – First Differences*

| LnFinal | ADF | PP | KPSS |
|---|---|---|---|
| Test Statistics | -5.49 | -5.75 | 0.08 |
| 1% | -2.60 | -2.60 | 0.73 |
| 5% | -1.94 | -1.94 | 0.46 |
| 10% | -1.61 | -1.61 | 0.34 |
| LnGDP | ADF | PP | KPSS |
| Test Statistics | -3.90 | -7.18 | 0.08 |
| 1% | -2.60 | -2.60 | 0.73 |
| 5% | -1.94 | -1.94 | 0.46 |
| 10% | -1.61 | -1.61 | 0.34 |

As seen in Table 4, public consumption expenditure and GDP variables became stationary after taking the first difference. Therefore, public consumption expenditure and GDP variables are I(1) variables.

When starting the analysis, the appropriate lag length must first be determined. By determining the lag length, the order of the model is determined. The model is estimated with this delay.

**Table 5:** *Model Lag Length*

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 22.01383 | NA | 0.001677 | -0.714780 | -0.642446 | -0.686736 |
| 1 | 191.7970 | 321.3753* | 4.50e-06* | -6.635607* | -6.418605* | -6.551476* |
| 2 | 193.1579 | 2.478761 | 4.95e-06 | -6.541353 | -6.179683 | -6.401135 |

As seen in Table 5, the order of the model was determined as (1) using the Akaike information criterion. The residuals of the determined 1st order vector autoregressive model are checked.

**Table 6:** *Remains of the Model*

| Component | Jarque-Bera | df | Probability Values |
|---|---|---|---|
| 1 | 4.344081 | 2 | 0.1139 |
| 2 | 1.849897 | 2 | 0.3966 |
| Joint | 6.193978 | 4 | 0.1851 |

$H_0$ = Residues are normally distributed.

$H_1$ = Residues are not normally distributed.

Since 0.1851>0.05, the null hypothesis is accepted, and the residuals in the model are normally distributed. The normal distribution of the model is important for constructing F statistics and confidence intervals.

If the model is determined in which order, it is expected that there will be no autocorrelation in that order. At this point, the results of the LM tests are examined.

$H_0$ = There is no autocorrelation.

$H_1$ = There is autocorrelation.

**Table 7:** *LM Test*

| Lag | LRE*stat | df | Prob. | Rao F-stat | df | Probability Value |
|---|---|---|---|---|---|---|
| 1 | 4.315994 | 4 | 0.3649 | 1.090548 | (4, 108.0) | 0.3650 |
| 2 | 1.076116 | 4 | 0.8980 | 0.267881 | (4, 108.0) | 0.8981 |

As can be seen in Table 7, the null hypothesis was accepted since the probability value in the 1st order was 0.3650>0.05. There is no autocorrelation in the model.

In order to establish a VAR model, there should be no problem of varying variance in the model.

$H_0$ = There is fixed variance.

$H_1$ = There is varying variance.

**Table 8:** *Joint Test*

| Chi-sq | df | Probability Value |
|---|---|---|
| 9.716707 | 12 | 0.6408 |

Since the valence value is 0.6408>0.05, H0 is accepted. There are fixed variants in the model. In order to ensure the stationarity and stability condition of the VAR model, it must be in the unit circle and the inverses of all AR roots must be less than 1.

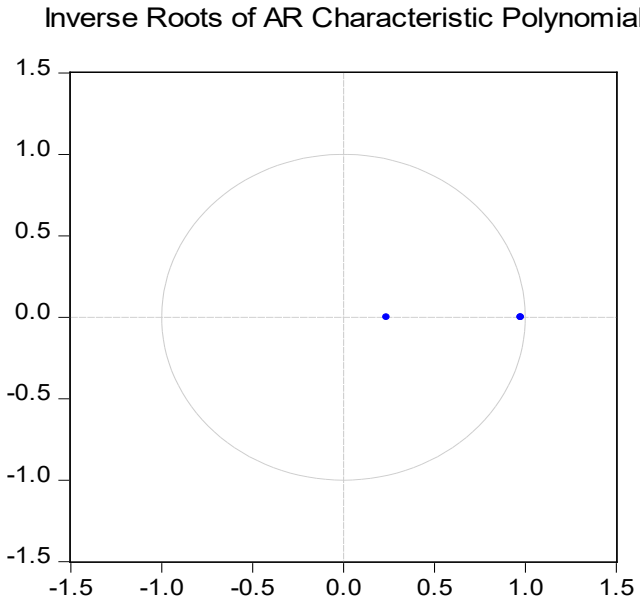


**Figure 1.** *Unit Circle View of Characteristic Roots of the VAR Model*

**Table 9:** *Stability of the VAR Model*

| Root | Modulus |
|---|---|
| 0.975885 | 0.975885 |
| 0.238260 | 0.238260 |

As seen in figure 1 and table 9, the model is in the unit circle and all AR roots have inverses less than 1.

The VAR model satisfies all the conditions. Therefore, it was decided that this model could be used. By performing variance decomposition, the order of the series is determined. The order of the series is determined from the most internal to the less internal.

**Table 10:** *Variance Decomposition*

| LNGDPUS | | | |
|---|---|---|---|
| Period | S.E. | LNGDPUS | DLNFINA |
| 1 | 0.063453 | 100.0000 | 0.000000 |
| DLNFINA | | | |
| 1 | 0.065349 | 77.50851 | 22.49149 |

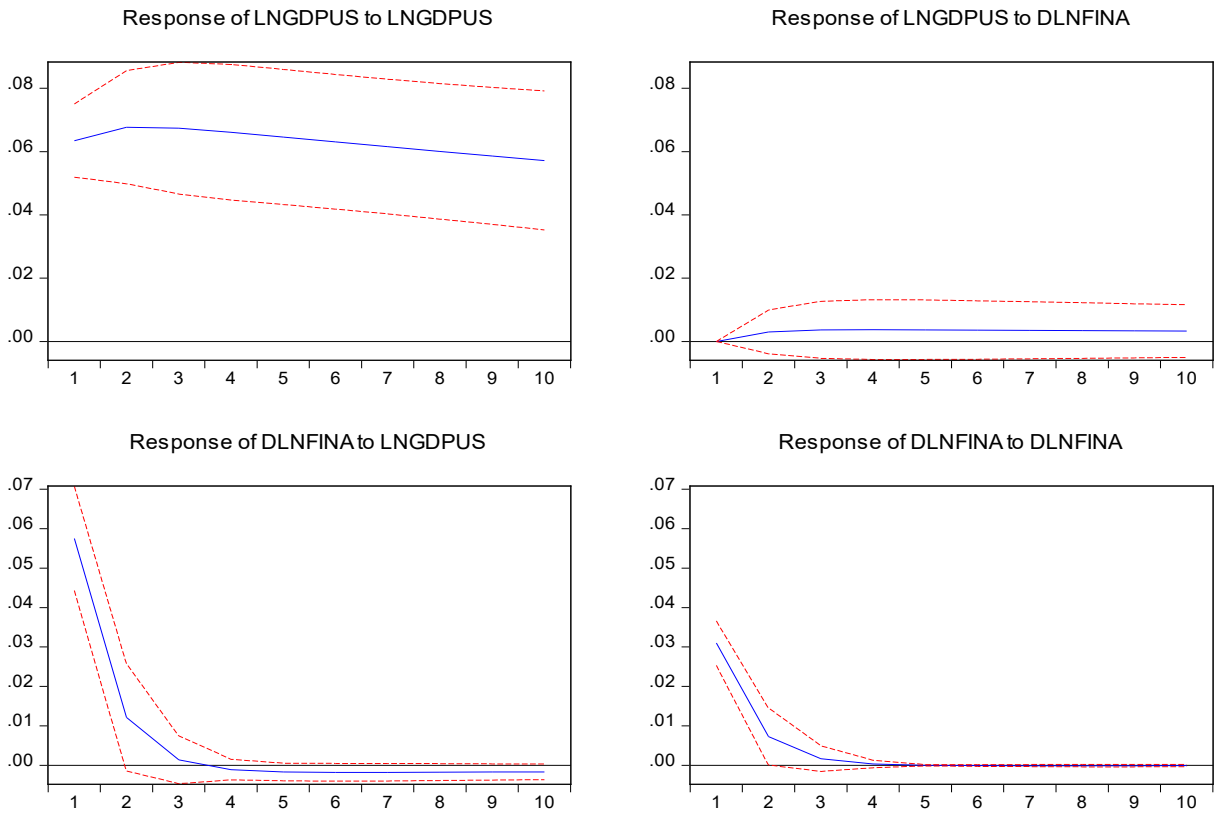


**Figure 2.** *Action-Response Functions*

### 2.2. Causality Test

In order to find the direction of the relationship between the variables, causality analyzes are performed. The results of causality analyses are given in Table 11.

**Table 11:** *Granger Causality Analysis*

| LNGDPUS | Chi-sq | df | Probability Values |
|---|---|---|---|
| DLNFINA | 0.751575 | 1 | 0.3860 |
| All | 0.751575 | 1 | 0.3860 |
| DLNFINA | Chi-sq | df | Probability Values |
| LNGDPUS | 2.650544 | 1 | 0.1035 |
| All | 2.650544 | 1 | 0.1035 |

When Table 11 is examined, it can be said that those with a probability value greater than 0.05 do not have a significant relationship, while those with a small probability have a significant relationship. In this direction, in the examination; No significant relationships were found between the variables.

### 2.3. Toda-Yamamoto Test

A VAR model was created to determine the appropriate lag length for the model. The appropriate lag length calculated for the VAR model was calculated as VAR (1).

For model estimation, the lag length (k) value should be added to the highest level of stationarity (dmax) included in the variables. VAR (k+dmax) = k + dmax = 2

Hypotheses in Toda-Yamamoto analysis;

$H_0$ = There is no causal relationship.

$H_1$ = There is a causal relationship.

LNFINAL = C(1)*LNFINAL(-1) + C(2)*LNFINAL(-2) + C(3)*LNGDPUS(-1) + C(4)*LNGDPUS(-2) + C(5)

LNGDPUS = C(6)*LNFINAL(-1) + C(7)*LNFINAL(-2) + C(8)*LNGDPUS(-1) + C(9)*LNGDPUS(-2) + C(10)

**Table 12:***Toda-Yamamoto Causality Test Results*

| Basic Hypothesis | Chi-Square Test | Statistical Probability Value | Relationship and Direction |
|---|---|---|---|
| GDP → Final | 4.487202 | 0.1061 | H1 accepted, there is a causal relationship. |
| Final → GDP | 3.379989 | 0.1845 | H0 accepted, there is no causal relationship. |

The table value is determined as 3.841459. Considering the chi-square test statistic and the probability values, the causality relationship from GDP variable to public consumption expenditures has been determined since it is 4.487202>3.841459. If it is from public consumption expenditures to the GDP variable, since 3.379989<3.841459, a causal relationship could not be determined.

**3. Conclusion**

Economic growth is a macroeconomic indicator that is desired to be sustainable for both developed and developing countries. And this indication is defined by the GDP variable in the literature. For this reason, those who are interested in economics frequently investigate the variables that affect economic growth. Whether public expenditures are effective on economic growth or public expenditures increase after economic growth, has been the subject of many theoretical and econometric analyzes in the past and today. One of the most important issues of curiosity based on the emergence of these studies is the role of states in economic life and their effects on the economy.

When the relevant literature is examined, it is seen that the direction and effect of the relationship between public expenditures and economic growth vary based on the countries and periods examined. It is seen that the majority of the studies detect a one-way or two-way positive relationship between the variables. Among these studies, especially Ghali (1999), Kolori and others are of importance. The studies of (2000) and Ahuja and Pandit (2020) draw attention to the conclusion that public expenditures have a positive effect on economic growth. In this study, the relations between public consumption expenditures and GDP were investigated by using annual time series data for the period of 1960-2021 for Turkiye. Traditional unit root tests were used to determine the stationarity of the variables. In this context, the Extended Dickey-Fuller unit root test, Phillips-Perron unit root test, and Kwiatkowski-Philips-Schmidt-Shin (KPSS) unit root test were performed. Since the series was determined as a unit root, their first differences were taken. Then causality test was applied to the variables. According to the test results, no significant relationships were found between the variables.

In order to determine the relationships between the variables, the Todo-Yamamoto test was performed again. According to the results of the tests carried out to determine the cointegration relations, a causality relationship from the GDP variable to the public consumption expenditures has been determined. If it is from public consumption expenditures to the GDP variable, the causality relationship could not be determined.

According to the results obtained from the study, public consumption expenditures are affected as a result of the change in GDP, but GDP is not affected by the changes in public consumption expenditures according to the data of Turkiye for the period 1960-2020.

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