

# **Revisiting the Causality Between Tax Revenue and Economic Growth in Turkey: A Bootstrap Rolling-Window Approach**

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## **Abstract**

Governments have to spend money to meet social needs and intervene in economic life. Therefore, taxes can be used not only for fiscal purposes but also for extra-fiscal purposes. However, there are different approaches to the economic impact of taxes. While classical economics argues that taxes should be impartial, Keynesian economics and supply-side economics suggest that taxes can be utilized for socioeconomic reasons. This study analyses the causal relationship between tax revenues and economic growth using the bootstrap rolling-window approach for the Turkish economy based on the data of the period 1923-2017. The findings showed that there was a causal relationship between economic growth and tax revenues in both directions in different years. However, there was no relationship between the variables for the whole period. Changes in economic policies and tax amnesties have important implications for the interaction of variables.

**Keywords:** tax revenue; economic growth; bootstrap rolling-window; fiscal discipline; Turkish economy

## 1. Introduction

The major source of financing for public spending is tax revenues (Hungerford, 2006: 16). The capacity to increase tax revenues is important for every country, especially for developing countries. Because financial capacity has a decisive role in terms of building a solid-state structure. Also, developing countries need more tax revenues to invest more in economic and social areas such as education, health, and infrastructure (Savoia et al., 2019). Therefore, taxes can be used for different purposes.

The purposes of taxation are divided into two main groups: fiscal and extra-fiscal purposes. Fiscal purpose refers to the financing of public expenditures through taxes (Mokrý, 2006: 18). Extra-fiscal purposes of taxes include economic and social balances such as economic growth, price stability, full employment and fair income distribution (Erdem et al., 2003: 177).

According to classical economists, the purpose of the tax is only to provide income to the state. Hence, classical economists argue that taxation should be neutral. The impartiality of taxation means that tax does not affect the functioning of the market mechanism. Because the economy is in full employment, fiscal policy tools disrupt the distribution of resources (Dönmez, 2009: 173). In this context, classical economists argue that an increase in taxes will harm economic growth.

The approaches of classical economists were accepted throughout the world until the Great Depression of 1929. However, since this crisis could not be solved by the market mechanism, intervention by governments in the economy became inevitable. As a matter of fact, Keynes proposed the effective use of fiscal policy tools to ensure full employment (Bulut, 2002: 10). Thus, Keynes did not adopt the neutral tax policy of classical economists. Therefore, the extra-fiscal purposes of tax have also gained importance along with Keynes. According to Keynes, taxes should be increased and incremental revenues should be saved during the recovery phase of the cyclical fluctuations. When the contraction phase is entered, taxes should be reduced and a possible crisis should be prevented by spending the money saved at the high-income level (Adask, 2012). Keynes, on the other hand, suggested that increased accumulations would reduce national income, in the context of the paradox of thrift. These savings can be used to finance public spending and support investments through income and gains taxes (Nyenke & Amadi, 2019: 107).

After the stagflation in the 1970s, different economic approaches emerged. Of these, according to monetarism, the state should not intervene in the economy. If the state needs to intervene in the economy, it should do so through monetary policy instruments (Pinar, 2006: 19). On the other hand, supply-side economics has argued that consumption and investment expenditures can be increased by making large reductions in tax rates. It was suggested that economic growth will gain speed and productivity will increase in this way (Eker et al., 1997: 89). Therefore, there are different economic approaches regarding the effects of taxes on economic growth.

In the classical approach, the state is not assigned an active duty for growth. In the Harrod-Domar model, the state has a balancing role to prevent stagnation in the economy and to address this problem if a recession has occurred. Therefore, fiscal policies may affect long-term growth rates. The Solow model accepts that fiscal policies do not affect growth. Romer,

on the other hand, considered technology as an internal factor in the growth model and therefore assumed that the policies of the state that would support human capital and technological development would have a positive effect on growth (Bulut, 2009: 23-30).

This study aims to investigate the causal relationship between tax revenues and economic growth for the Turkish economy using the bootstrap rolling-window approach based on the data for the period 1923-2017. The remainder of the paper proceeds as follows. Section 2 reviews some relevant previous literature. Section 3 introduces data and methodology. Section 4 presents the main econometric results. Finally, Section 5 ends the paper with some concluding remarks.

## 2. Literature Review

There are many studies on the relationship between tax and economic growth. Theoretically, tax is generally considered to have a negative impact on economic growth. In other words, high tax rates mean low growth rates. That's because an increase in taxes would lower total supply as it would increase the production costs. Moreover, the increase in taxes affects the consumption and saving decisions of consumers. Therefore, high taxes may weaken growth performance (Nantob, 2014: 4). On the other hand, economic growth creates a positive result on tax revenues as it will increase revenues and earnings. However, the results of empirical studies differ. Table 1 presents a summary of a part of empirical studies.

*Table 1: Summary of Literature Review for Tax Revenue and Economic Growth*

Author(s)	Countries	Period	Methodology	Results
Vatavu et al. (2019)	Central and Eastern Europe (CEE) countries	1995-2015	Granger Causality	Taxes support economic growth.
Egbunike et al. (2018)	Nigeria and Ghana	2000-2016	Granger Causality	There is a positive impact of tax revenue on the gross domestic product.
Chimee et al. (2018)	Nigeria	1994-2015	Error Correction Model	There is an unidirectional causality running from VAT to GDP. The VAT has a positive and significant effect on GDP.
Eren et al. (2018)a	Turkey	1975-2013	BTY (1) and Frequency Domain Causality (2)	(1)There is an unidirectional causality between indirect tax revenue to economic growth. (2)There is an unidirectional causality between total and direct tax revenue to economic growth. There is an unidirectional causality between economic growth to indirect tax revenue.
Al-Abbadi & Abdul-Khaliq (2017)	Jordan	1998-2015	Granger Causality	There is an unidirectional relationship from general sales tax revenue to economic growth.
Loganathan et al. (2017)	Malaysia	1970-2015	Bootstrap Rolling Window Causality	There is an unidirectional causality running from GDP to taxation.

Organ & Ergen (2017)	Turkey	1980-2015	ECM Granger causality	There is an uni-directional causality between tax revenue to economic growth.
Abdiyeva & Baygonuşova (2016)	Kyrgyzstan	1995-2014	Granger Causality	There is a negative relationship between direct taxes and GDP. The positive causal relationship was detected between GDP and indirect tax revenues.
Ahmad et al. (2016)	Pakistan	1974-2010	ARDL Bounds Test	Total tax revenues have negative and significant effect, on economic growth, in long run.
Iriqat & Anabtawi (2016)	Palestine	1999-2014	Granger Causality	There is no significant impact of GDP and its components on tax revenues.
Terzi & Yurtkuran (2016)	Turkey	1980-2013	TY causality-U causality	TY: There is a bi-directional causality between total and direct tax revenue to economic growth. U: There is a bi-directional causality between total and direct tax revenue to economic growth.
Takumah (2014)	Ghana	1986-2010	Granger Causality	There is an uni-directional causality from tax revenue to economic growth.
Attari et al. (2014)	Pakistan	2003:M7-2012M7	Granger Causality	There is a bi-directional causality between tax revenue and economic growth.

Erdoğan et al. (2013)	Turkey	1998:I-2011:IV	Granger Causality	There is a bi-directional causality between total and direct tax revenue to economic growth.
Ünlükaplan & Arısoy (2011)	Turkey	1968-2006	ECM Granger causality	Sort run: There is an uni-directional causality from tax revenue to economic growth. Long run: There is a bi-directional causality between tax revenue to economic growth.
Mucuk & Alptekin (2008)	Turkey	1975-2006	Granger causality	There is an uni-directional causality from indirect tax revenue to economic growth.
Temiz (2008)	Turkey	1960-2006	ECM Granger causality	There is a bi-directional causality between tax revenue to economic growth.
Durkaya & Ceylan (2006)	Turkey	1980-2004	Granger causality	There is no causality between GDP and indirect tax revenues.

Notes: TY; Toda and Yamamoto (1995), U; Sims (1980) unrestricted VAR approach. BTY; Hacker and Hatemi-J (2006) asymptotic and bootstrap approach to TY. <sup>a</sup> In this study, the GDP per capita variable represents the concept of development.

### 3. Data, Methodology and Empirical Results

There are theoretically different approaches regarding the relationship between tax revenues and economic growth. Which of these approaches is valid can be tested through econometric methods. Table 2 shows the data used to determine the interaction between these variables by econometric methods.

Table 2: Data and Sources

Variable	Abbreviation	Source	Sample
Tax Revenue	Intr	Turkish Revenue Administration	1923-2017
Gross Domestic Product (1998 constant LCU)	lngdp	Turkish Ministry of Development <sup>a</sup> and World Bank (World Development Indicators) <sup>b</sup>	1923-2017

Note: <sup>a</sup>1923-2014. <sup>b</sup>2015-2017.

The bootstrap rolling-window (BRW) causality approach developed by Balçılar et al. (2010) was preferred to investigate the relationship between tax revenues and economic growth for Turkey. One of the basic steps of the method is unit root tests.

For this purpose, Fourier type, Fourier Augmented Dickey-Fuller (FADF) (Enders & Lee, 2012a), Fourier Modified Dickey-Fuller (FGLS) (Rodrigues & Taylor, 2012) and Fourier Kwiatkowski-Phillips-Schmidt-Shin (FKPSS) (Becker) et al., 2006) unit root tests were used. Becker et al. (2006: 381-382) states that Fourier type unit root tests acting based on the assumption that the structural breaks occurring in linear or nonlinear time series are unknown and are gradually determined as a whole can give more consistent and reliable results about the stationarity of series. These tests provide more consistent and reliable results in

determining the stationarity of a linear or non-linear time series (Yalçinkaya, 2019: 42). If there is a structural break or non-linear trend in the series, there must be at least one Fourier frequency in the process (Enders & Lee, 2012b).

On the other hand, it is not necessary to know the number of breaks or the form of breaks, and the break date is not calculated in the Fourier tests, which is a flexible approach. Table 3 shows the results of unit root tests.

Table 3: The Results of Fourier Unit Root Test

Series	Constant														
	FADF					FGLS					FKPSS				
Level	Stat.	L	K	%5	%10	Stat.	L	K	%5	%10	Stat.	L	K	%5	%10
GDP	-1.13	3	1	-3.81	-3.49	0.49	3	1	-3.91	-2.32	2.64	---	1	0.17	0.13
Tr	-0.95	3	1	-3.81	-3.49	0.07	2	1	-3.91	-2.32	2.64	---	1	0.17	0.13
	Constant and Trend														
	Stat.	L	K	%5	%10	Stat.	L	K	%5	%10	Stat.	L	K	%5	%10
GDP	-2.18	3	1	-4.35	-4.05	-2.40	3	1	-4.17	-3.87	0.25	---	1	0.05	0.04
Tr	-2.54	2	2	-4.05	-3.71	-2.20	3	1	-4.17	-3.87	0.29	---	1	0.05	0.04
First dif.	Constant														
	Stat.	L	K	%5	%10	Stat.	L	K	%5	%10	Stat.	L	K	%5	%10
ΔGDP	-5.53 <sup>a</sup>	3	1	-3.81	-3.49	-5.38 <sup>a</sup>	3	1	-3.91	-2.32	0.09 <sup>a</sup>	---	1	0.17	0.13
ΔTr	-3.02	3	1	-3.81	-3.49	-2.84 <sup>b</sup>	3	1	-3.91	-2.32	0.18	---	1	0.17	0.13
	Constant and Trend														
	Stat.	L	K	%5	%10	Stat.	L	K	%5	%10	Stat.	L	K	%5	%10
ΔGDP	-5.59 <sup>a</sup>	3	1	-4.35	-4.05	-5.48 <sup>a</sup>	3	1	-4.17	-3.87	0.07	---	1	0.05	0.04
ΔTr	-3.92 <sup>b</sup>	3	2	-4.05	-3.71	-2.96	3	1	-4.17	-3.87	0.15	---	1	0.05	0.04

Notes: The maximum number of Fourier is 5. The maximum lag (3) is defined according to the AIC information criterion. The critical values of each test were compiled from the table values in the related articles. L: lag number, K: Fourier number. a, b show statistically significant levels of 5% and 10%. Δ notation indicates the first difference in the series.

In the FKPSS test, the basic hypothesis that "there is no unit root in the series" cannot be rejected if the calculated value is smaller than the critical table value. However, in FGLS and FADF tests, the basic hypothesis is that "there is a unit root in the series". Therefore, according to FGLS and FADF tests, if the calculated value is smaller than the critical table values, it is decided that the series is not stationary. In this context, all of the unit root tests show that the series contains unit root at the level. On the other hand, all of the series do not contain unit roots in their first difference I (I), that is, they become stationary.

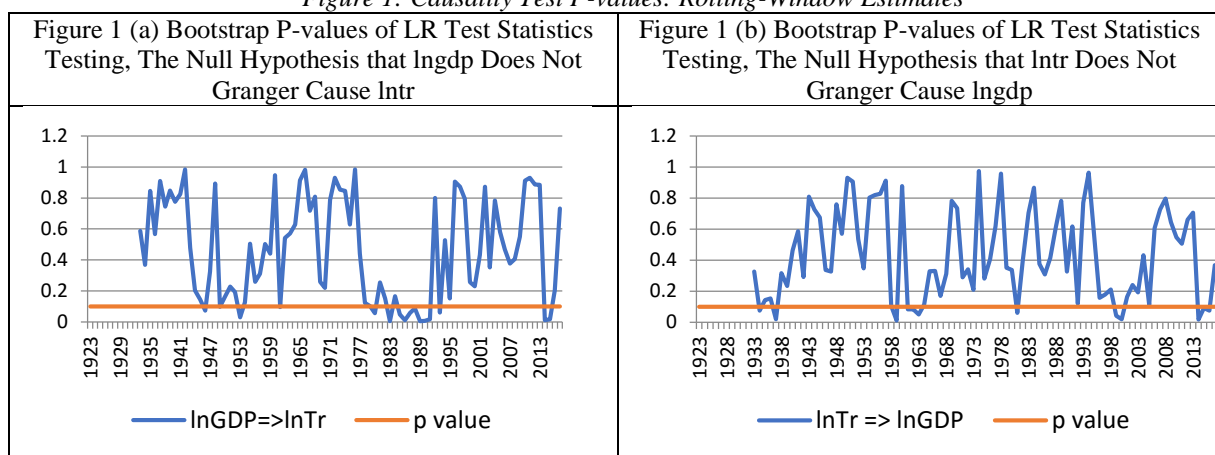
After unit root tests, the rolling window approach developed by Balçılar et al. (2010) was used to determine the causal relationship between tax revenues and economic growth in Turkey.

Balçılar et al. (2010) apply the corrected likelihood ratio (LR) causality test based on the residual-based bootstrap method which that process developed by Kourtris et al. (2008) and Shukur & Mantolas (2000). In the presence of structural change, the dynamic links between



the growth and tax revenue can show instability across different sub-samples. This instability by applying the bootstrap causality test to rolling-window sub-samples for  $t = \tau - l + 1, \tau - l, \dots, \tau, \tau = l, l + 1, \dots, T$ , where  $l$  is the size of the rolling window (Balcilar et al., 2010: 1400). The bootstrap rolling-window estimation has two important justify. First, the rolling window adopts the view that the relationship between variables changes through time. Second, instability across different sub-samples due to structural change and the rolling-window estimation captures this process (Nyakabawo et al., 2015: 59). Figure 1 shows the bootstrap p-values of rolling test statistics.

Figure 1: Causality Test P-values: Rolling-Window Estimates



Note: P value is %10.

The years in which causal relationships between variables are observed according to Figure 1 (a) and Figure 1 (b) are summarized in Table 5. The results show that there is a causality between economic growth and tax revenues (in the direction of tax revenues) in 1946, 1949, 1953, 1961, 1980, 1983, 1985, 1986, 1987, 1988, 1989, 1990, 1993, 2014 and 2015. The fact that production activities started to gain momentum after the Second World War and liberal practices in the economy were opened to the discussion had positive results in terms of growth.

This situation brought about a causal relationship between economic growth and tax revenues (in the direction of tax revenues) in 1946, 1949 and 1953. A similar situation also emerged in the 1980s. As a matter of fact, as a result of the adoption of neoliberal policies with the January 24, 1980 Decisions, a new economic model was switched to. The effects of the new economic model on growth were reflected in tax revenues. The recession in the late 1980s and the liberalization of capital movements also led to fluctuations in tax revenues through growth. The causality in 2014 can be attributed to tax amnesties.

Table 5: Abstract of Rolling Window Causality Results

Sample	lnGDP → lnTr	lnTr → lnGDP
1923-2017	1946 <sup>a</sup> , 1949, 1953, 1961 <sup>a</sup> , 1980, 1983 <sup>a</sup> , 1985 <sup>a</sup> , 1986, 1987, 1988 <sup>a</sup> , 1989, 1990 <sup>a</sup> , 1993, 2014 <sup>a</sup> , 2015	1934 <sup>a</sup> , 1937, 1959 <sup>a</sup> , 1961 <sup>a</sup> , 1962, 1963 <sup>a</sup> , 1981 <sup>a</sup> , 1999, 2000, 2014 <sup>a</sup> , 2015, 2016 <sup>a</sup>

Notes: The → notation indicates the direction of causality. <sup>a</sup> denotes the period of tax amnesty in Turkey.

In Turkey, there is also a causal relationship between tax revenues and economic growth (in the direction of economic growth) in various years. In this context, tax revenues in 1934, 1937, 1959, 1961, 1962, 1963, 1981, 1999, 2000, 2014, 2015 and 2016 were observed to have an impact on economic growth. The effect in question is particularly noteworthy in the periods when tax amnesties were declared. On the other hand, full-sample LR test results of the bootstrap rolling-window causality test developed by Balcilar et al. (2010) are shown in Table 6.

*Table 6: Full Sample Rolling-Window Between Intr and lngdp*

Sample	P	H <sub>0</sub> : Intr Does Not Granger Cause lngdp		H <sub>0</sub> : lngdp Does Not Granger Cause Intr	
		LR-statistic	Bootstrap P-value	LR-statistic	Bootstrap P-value
1923-2017	1	2.951	0.544	2.934	0.582

*Notes: P indicates the maximum number of lags. The maximum number of lags was selected according to the AIC information criterion*

These results show that there is no causal relationship between tax revenues and growth between the periods 1923-2017. In this context, results supporting Solow's hypothesis were obtained.

### 3. Conclusion

The usual source of financing for public expenditures is tax revenues. However, taxes can be used not only for fiscal purposes but also for economic and social purposes. In contrast, classical economics argues that taxes should be neutral. On the other hand, supply-side economics and Keynesian economics suggest that taxes can be utilized to achieve economic goals. Keynesian economics also states that increased revenues as a result of economic growth will increase tax revenues. In this study, the causal relationship between tax revenues and economic growth in Turkey was investigated with the help of the bootstrap rolling-window method for the period 1923-2017. In this context, the stationarity of the series was first tested and it was concluded that the variables were I (1). The causality findings showed that tax revenues affected economic growth in different periods. Similarly, it was determined that economic growth also affected tax revenues in different periods. It can be said that changes in economic policies and tax amnesties had an impact on this relationship. However, no causal relationship was found between tax revenues and economic growth for the whole period



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