The Link between GDP and Household Consumption Expenditures in the Long-run in Turkey: ARDL Analysis*

Cüneyt KOYUNCU[1] **Hüseyin Safa ÜNAL**[2]

[1]Prof. Dr., Department of Economics, Bilecik Şeyh Edebali University, Turkey, cuneyt.koyuncu@bilecik.edu.tr, ORCID: 0000-0002-8638-2761

[2]Res. Asst., Department of Economics, Bilecik Şeyh Edebali University, Turkey, hsafa.unal@bilecik.edu.tr, ORCID: 0000-0001-7841-5685

Abstract: This study is an attempt to find out the association between GDP and household consumption expenditures in Turkey covering the period between 1960 and 2018. For this purpose, ARDL analysis is utilized. First, Augmented Dickey-Fuller unit root tests are conducted. Both of the series are integrated of order one. ARDL bounds test results show that there is a long-run association between GDP and household consumption expenditures in Turkey. Residual tests to check heteroskedasticity and autocorrelation reveal that there are no heteroskedasticity or autocorrelation problems. And, CUSUM coefficient stability test shows that the long-run coefficients are stable. Although a long-run association between the series exists, there is no Granger causality link in any direction between GDP and household consumption expenditures. So, the behaviors of the series are related in the long-run but neither of them causes the change in the other's level.

Keywords: GDP, Household consumption expenditure, ARDL, Granger Causality.

JEL codes: E21, E60, H59.

1. Introduction

Personal consumption expenditure is an important part of the GDP. Approximately two thirds of the gross domestic product is household consumption expenditures (Tapsin & Hepsag, 2014). The importance of private consumption has constantly gained momentum specifically in the countries that has been in a neoliberal transformation since 1980s. In this respect, the impact of household consumption expenditures on GDP is expected to be direct. Besides the households' direct consumption expenditures, expenditures made by nonprofit institutions serving households (NPISH) can be considered as an effectual item that can change the GDP. For convenience, direct or these indirect consumption factors are combined and be referred as household consumption expenditures in this study. And, household consumption expenditures are expected to have tendency to raise GDP level.

In addition to comprehending the nature of the relationship, the composition of household consumption expenditure is another issue of concern. For Dai et al. (2012), spending on the material products and transportation or service-oriented goods can compose the household expenditures. Carbon dioxide emissions decrease considerably when the spending on the service-oriented goods increase rather than the material products or transport. Hence, if the household consumption is directed to goods that have carbon-intensive production processes, there will be a negative externality to the environment. Service-oriented goods production, on the other hand, costs less to the economy. Therefore, to decide on how to increase GDP, pros and cons of the effects of household consumption has to be deeply examined.

The literature on the effect of household consumption expenditures on GDP is broader. But, there are researches searching for the relationship in the reverse order as well. Empirical evidence shows that 1 dollar increase in the GDP raises the household consumption by 0.566 dollars in the Euro Zone (Tapsin & Hepsag, 2014). In the study they investigate the relationship between GDP and consumption expenditure of Nigeria between 1981 and 2010, Akekere and Yousou (2012) reveal that one dollar increase in the GDP results in a 0.67 dollar increase in the private consumption expenditure. Apere (2014), on the other hand, finds the marginal propensity to consume as 0.92 for the period between 1981 and 2012. That is, only 8% of the total income is saved and directed to investment. 1% increase in the autonomous expenditure, however, can increase income by 12.5%. Hence, economy is led by government intervention mostly. Shaikh et al. (2015) estimate the marginal propensity to consume as 0.821 which

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implies that rise of the household income by one Pakistani rupee causes a 0.821 rupee increase in the household consumption expenditure in Pakistan for the years between 1985 and 2011. So, the household final consumption expenditure is one of the most significant determinants of the GDP, considering the corresponding multiplier effect of the consumption. Pakistan has a consumer-driven GDP growth. Mishra (2011) claims that the studies in the literature on the GDP composition have a consensus on that the economic growth is consumption-driven in developing countries. He tests the hypothesis by using data of India for a sample period of 1950 to 2009. According to him, there is a negative relationship between real consumption expenditure and GDP.

Rather than the sign of the relationship, Amin (2011) focuses on the direction of the relationship. He tries to find the causality between consumption expenditure and economic growth in Bangladesh between 1976 and 2009. And, empirical evidence suggests that the consumption is a result of the economic growth in Bangladesh. However, Chioma (2009) asserts that there is not any significant causal relationship between the GDP and the personal consumption expenditure in Nigeria for the years between 1994 and 2007. Baker and Orsmond (2010) claim that the share of the household consumption in the national income of China falls recently. So, it is not unusual to expect a fall in the effect of consumption on the GDP in economies having similar characteristics. This trend might change the significance of the causality a well.

The topic, whether GDP affects consumption or consumption affects GDP, has attracted the attention of researchers. Wagner's Law (1958) states that public expenditure is an integral part of the national income and public expenditure is endogenously affected by the growth of income. On the other hand, Keynes (1936) asserts just the reverse. Public expenditures exogenously affect the national income. Indeed, they have disagreement on the direction of the causality as well. This study, on the other hand, focuses on the relationship between GDP and household consumption expenditure, rather than government consumption or investment expenditures. Yet, the literature on the association between government expenditures and GDP is also examined.

Government consumption expenditures are the missing part of the whole picture of the consumption. The share of the government consumption expenditure is in a negative relationship with the GDP based on the data for over 100 countries between 1961 and 1976 (Landau, 1983). That is, economic expansion of government jeopardizes economic growth, although the welfare might not behave in the same way. Barro's (1991) findings on 98 countries in the period 1960-1985 support the negative association between government consumption and economic growth as well.

Devarajan et al. (1996) show that the diminishing productivity of the capital component of public expenditures is the main reason for the negative relationship. The association between government expenditures and growth rate is positive, but the sign of the relationship changes after a threshold level. The relationship is non-linear because productive expenditures might become unproductive if excess amount of them are available in the economy. Tanninen (1999) finds the threshold level for government expenditure on public goods as 6.6% of the GDP. Ahmed and Miller (2000), on the other hand, assert that different components of the government expenditures have different effects on the domestic investments in developing economies. For instance, expenditure on social security and welfare, and tax-financed government expenditure crowd out domestic investments. But, transportation and communication expenditures stimulate private investments in developing countries. Hence, while government expenditures partly cause GDP to decrease, they partly cause GDP to increase in the long run.

Fernald (1999) states that road building of 1950's and 1960's in the U.S. is a one-time stimulant rather than a continuous boost to productivity and growth. So, crowding in effect of government expenditure on transportation might not exist in the long run. Fouladi's (2010) findings confirm the sectoral differences in the effectiveness of the government expenditure on GDP. While rise in government consumption expenditure results in reduction in production, employment an investment, government investment expenditure has different impacts on the economic performance depending on the area investment expenditure is spent. According to Fouladi (2010), government resources directed to the oil and gas or service sectors lead to expansion in the GDP. But, if the sources are spent in the agricultural, construction or industry and mining sectors, this has a negative effect on GDP. So, depending on in which sector government expenditure is utilized, production and investment can be stimulated. Fölster and Henrekson (1999) claim that the analyses seeking to find the nature of the relationship between public expenditures and growth rate have to consider that rich and poor economies do not behave in the same way. They

find out that large public expenditures negatively affect the growth rate in a more robust way in rich countries.

Thus, there is no consensus on the direction of the causality between consumption expenditures and GDP. Researchers have not been able to reach an agreement even on the sign of the relationship. So, this study attempts to provide an explanation to the long-term nature of the relationship between consumption and income in Turkey.

The rest of the paper is organized as follows. The next part summarizes the characteristics of the data and the method utilized. The third section is for the empirical results and the detailed discussion. Fourth part concludes the study.

2. Material and Methods

Annual GDP per capita data of Turkey for the period between 1960 and 2018 are retrieved from World Development Indicators (WDI) database of the World Bank (2019a). Data for Households' and NPISH's final consumption expenditure covering the same period are accessed from the WDI (2019a) as well. It is the market value of "all goods and services, including durable products, purchased by households" (World Bank, 2019b). The expenditures of nonprofit institutions serving household are taken into account in the series as well. Both series are in current US dollars.

For an ARDL analysis to be utilized, first step is to conduct unit root tests. Stationarity of the series are checked by using Augmented Dickey-Fuller test statistics. If there is unit root in the unit circle, then the series is not stationary. The series have to be stationary at levels or after the first differences are taken. That is, series must be integrated of order 0 or 1.

Then, proper model specification is chosen based on the Schwarz information criterion. After, ARDL bounds test is used to examine if there exists any long-run relationship between the series. If the F-statistcs is larger than the I(1) bound, the null hypothesis stating that there is no long-run relationship is rejected. If the F-statistcs is lower than the I(0) bound value, researcher is fail to reject null hypothesis. If the F-statistcs is in between the I(0) and I(1) bound values, then the test is inconclusive.

If the ARDL bounds test results indicate that there exists long-run relationship between the series, cointegrating form and long-run coefficients are estimated, then. Residual tests are conducted if there is any heteroskedasticity or serial correlation problem. Lastly, CUSUM stability test, and Granger causality tests are utilized.

3. Results and Discussion

Table 1 is a summary of the unit root test results. For both log GDP per capita and log consumption, the null hypothesis cannot be rejected. That is, both series have unit roots in the unit circle. So they are not stationary at levels. However, the null hypothesis that the variable has a unit root is rejected after the first difference is taken for both series. They are stationary. Both log GDP per capita and log Consumption are integrated of order 1, i.e. I(1).

Table 1: Unit Root Tests

Null: Variable has a unit root

		ADF test statistic
Variable	**Constant**	**Constant, linear trend**
log GDPPC	-0.5591	-3.0899
log Consumption	-0.6792	-2.3649

Null: Variable has a unit root

		ADF test statistic
Variable	**Constant**	**Constant, linear trend**
Δlog GDPPC	-8.4512***	-8.4133***
Δlog Consumption	-8.2765***	-8.3470***

*** indicates significance at 1% level.

Figure 1 is a demonstration of model selection criteria results. And, Table 2 is a list of 20 potential ARDL models with information criteria of each model. The lowest Schwarz information criteria, -3.06102 is reached at ARDL(1,1) model. So, ARDL(1,1) is chosen as the optimal model. Hannan-Quinn information criterion supports the finding too.

Figure 1: Model Selection Criteria Graph (Schwarz)

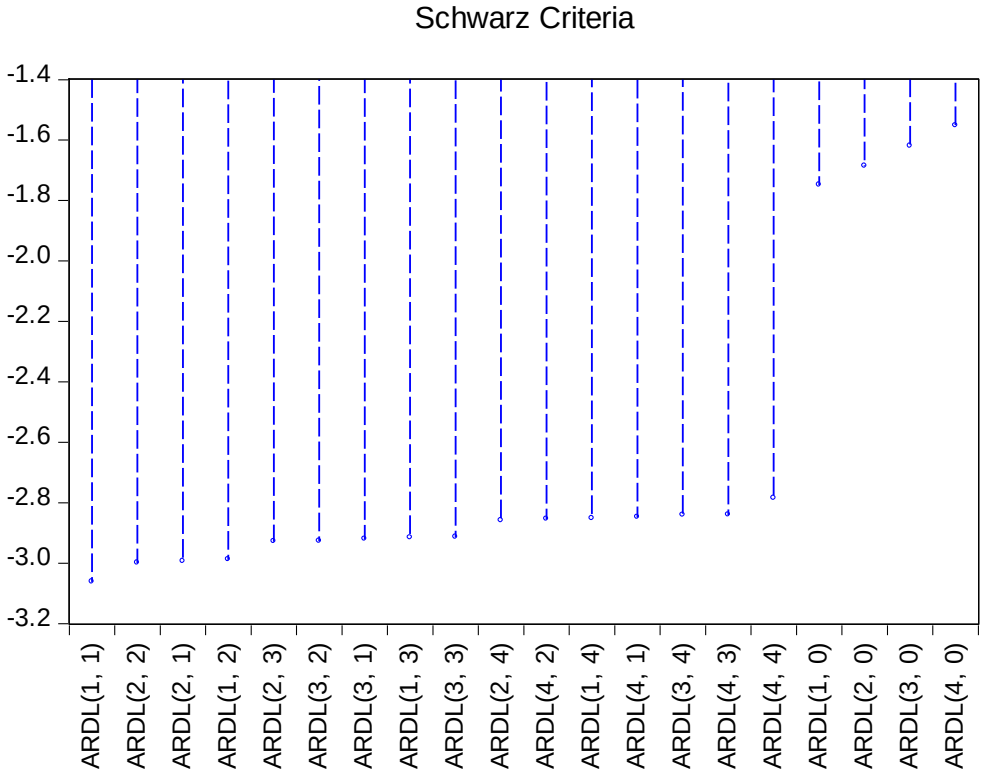


Table 2: Model Selection Criteria-log Consumption

Dependent Variable: log Consumption

Model	LogL	AIC	BIC*	HQ	Adj. R-sq	Specification
19	92.192602	-3.207	-3.06102	-3.15055	0.998902	ARDL(1, 1)
13	94.482358	-3.21754	-2.99856	-3.13286	0.998948	ARDL(2, 2)
14	92.324994	-3.17545	-2.99297	-3.10489	0.998885	ARDL(2, 1)
18	92.198789	-3.17087	-2.98838	-3.1003	0.998880	ARDL(1, 2)
12	94.536193	-3.18313	-2.92766	-3.08434	0.998928	ARDL(2, 3)
8	94.500815	-3.18185	-2.92637	-3.08305	0.998927	ARDL(3, 2)
9	92.336123	-3.1395	-2.92051	-3.05481	0.998863	ARDL(3, 1)
17	92.207540	-3.13482	-2.91584	-3.05014	0.998858	ARDL(1, 3)
7	96.133768	-3.20486	-2.91289	-3.09196	0.998967	ARDL(3, 3)
11	94.644658	-3.15072	-2.85874	-3.03781	0.998910	ARDL(2, 4)
3	94.504227	-3.14561	-2.85363	-3.0327	0.998904	ARDL(4, 2)
16	92.430412	-3.10656	-2.85108	-3.00777	0.998843	ARDL(1, 4)
4	92.351970	-3.10371	-2.84823	-3.00491	0.998840	ARDL(4, 1)
6	96.162385	-3.16954	-2.84107	-3.04252	0.998946	ARDL(3, 4)
2	96.133791	-3.1685	-2.84003	-3.04148	0.998945	ARDL(4, 3)
1	96.608436	-3.1494	-2.78443	-3.00826	0.998940	ARDL(4, 4)
20	54.077650	-1.85737	-1.74788	-1.81503	0.995693	ARDL(1, 0)
15	54.362064	-1.83135	-1.68536	-1.77489	0.995654	ARDL(2, 0)
10	54.552294	-1.8019	-1.61942	-1.73133	0.995597	ARDL(3, 0)
5	54.714918	-1.77145	-1.55247	-1.68677	0.995534	ARDL(4, 0)

In Table 3, The F-statistic computed based on the ARDL(1,1) model is large than the upper bound for the critical value at 5% level of significance. That is, F-statistic=4.336956> 4.16=I(1). So, there is a

cointegrating relationship between log GDP per capita and log consumption at 5% level of significance. Test becomes inconclusive if the significance level is chosen as 2.5%. Null hypothesis stating that there is no long-run relationship cannot be rejected if the significance level is chosen as 1%.

Table 3: ARDL Bounds Test-ARDL (1, 1)

Null Hypothesis: No long-run relationships exist		
Test Statistic	**Value**	**k**
F-statistic	4.3370	1

Critical Value Bounds		
Significance	**I(0) Bound**	**I(1) Bound**
10%	3.02	3.51
5%	3.62	4.16
2.50%	4.18	4.79
1%	4.94	5.58

Cointegrating form and long-run coefficients are presented in Table 4. In the long-run, %1 increase of GDP per capita results in a rise of household consumption expenditure by %1.2084. And the adjustment is very slow. It lasts a year to correct only the 6% of the errors of the previous year. That is, one time deviation from the long run equilibrium would be totally cleared in 17.793 years.

Table 4: ARDL Cointegrating and Long Run Form

Dependent Variable: log Consumption		
	Cointegrating Form	
Variable	**Coefficient**	**Prob.**
D(logGDP)	0.9884***	0
CointEq(-1)	-0.0562***	0.0006

	Long Run Coefficients	
Variable	**Coefficient**	**Prob.**
logGDP	1.2084***	0
Constant	15.9866***	0
*** indicates significance at 1% level		

Table 5 summarizes ARCH heteroskedasticity test and Breusch-Godfrey serial correlation LM test results. Null hypotheses cannot be rejected at 1% significance level. Therefore, there is no heteroskedasticity problem in the residuals of the model at 1% level of significance. And, there is no serial correlation problem in the residuals of the model at 1% significance level.

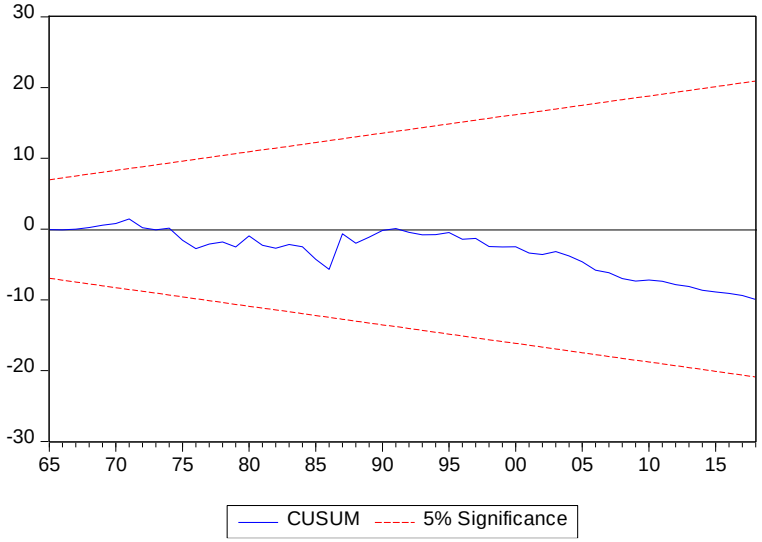
Table 5: Heteroskedasticity and Serial Correlation Tests

ARCH Heteroskedasticity Test	
F-statistic	**Prob. F(1,55)**
0.8347	0.3649

Breusch-Godfrey Serial Correlation LM Test	
F-statistic	**Prob. F(1,53)**
4.3203	0.0425

The coefficients of the model are stable since cumulative sum of residuals lies inside the 5% significance level bounds, as to CUSUM coefficient stability test.

Figure 2: CUSUM stability test



To check Granger causality between the variables a VAR(p) model has to be estimated. Since p=k+dmax=3, a VAR (3) model is estimated to check the causalities. That is, the lowest Schwarz information criteria is -3.8258 in lag 2 among the VAR models listed in Table 6. So, optimal lag length is 2 (i.e., k=2). As to unit root test results, the maximum integration order is one among variables, i.e. dmax=1. That is the reason why VAR(3) is estimated and the Granger causality is conducted based on this model in Table 7.

Table 6: Vector Autoregression Estimations

VAR(k) Model	**SIC**
VAR (1)	-3.7999
VAR (2)	-3.8258
VAR (3)	-3.5968

Chi-square test statistics show no significant relationship between the variables in Table 7. That is, the lag value of the independent variable is not important in explaining the characteristics of the dependent variable (Ahmed, 2011). There is no Granger causality link between log GDP per capita and log Consumption.

Table 7: VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: log Consumption			
Excluded	**Chi-sq**	**df**	**Prob.**
log GDP	5.9364	3	0.1147

Dependent variable: log GDP			
Excluded	**Chi-sq**	**df**	**Prob.**
log Consumption	4.8518	3	0.1830

4. Conclusions

There is no causality between the GDP per capita and the household consumption expenditures in Turkey between 1960 and 2018. However, there is a stable relationship between them in the long run. Long run increase in the GDP per capita stimulates household consumption expenditures in Turkey. %1 rise in the GDP per capita results in a %1.2084 increase in the household consumption expenditure, which might lead to an expansion in the production in return. As a result, GDP might increase when the loop is completed.

Households' direct consumption expenditures and NPISH's consumption expenditures together are assumed to constitute household consumption expenditure. A detailed analysis examining all

constituent parts of the household consumption expenditure separately might reveal different implications. So, further studies breaking household consumption expenditures into parts might be complementary to the findings of this research. Besides, the nature of the association between government expenditures and GDP might be interesting as well.

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