7. IS THERE A LONG-RUN RELATIONSHIP BETWEEN TAXATION AND GROWTH: THE CASE OF TURKEY

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Abstract

This paper empirically investigates long-run equilibrium relationship between economic growth and tax revenues in Turkey by using the bounds test and Johansen technique for cointegration. Results suggest that the existence of long-run equilibrium relationship between economic growth and taxation cannot be confirmed in the case of Turkey as a result of the bounds and Johansen tests for cointegration. Thus, further investigation such as error-correction modeling and/or causality analysis cannot be preceded between these two variables in the case of the Turkish economy.

Keywords: taxation, growth, long-run relationship, Turkey
JEL Classification: C32, H20, O40

1. Introduction

The relationship between fiscal policy and economic growth has found a wide application area in growth literature. However, theoretical investigation on the effect of fiscal policy on economic growth is still inconclusive (Tosun and Abizadeh, 2005). On the other hand, numerous studies have investigated the empirical relationship between tax and growth. Engen and Skinner (1999) suggested five possible mechanisms by which taxes can affect economic growth: (1) investment rate can be inhibited through taxes like corporate and personal income, and capital gains taxes; (2) taxes can slow down growth in labor supply by distorting labor-leisure choice in favor of leisure; (3) tax policy can affect growth in productivity through its discouraging affect on R&D (research and development) expenditures; (4) taxes can lead to a flow of resources to other (lower taxed) sectors that may have lower productivity (Harberger Framework); and (5) high taxes on labor supply can distort the efficient use of human capital by discouraging workers from jobs having high tax burdens (See also Tosun and Abizadeh, 2005).

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Numerous studies have investigated the empirical relationship between tax and growth. Leibfritz *et al.* (1997), Plosser (1992), Barro (1991) and King and Rebelo (1990) suggest that a growth in tax volume leads to a reduction in growth while Kneller *et al.* (1999), Slemrod and Yitzhaki (1995) and Levine and Renelt (1992) report a non-significant or even positive correlation between the two. On the other hand, Tosun and Abizadeh (2005) found that economic growth, measured by gross domestic product (GDP) per capita, had significant effect on the tax mix of OECD (Organization for Economic Cooperation and Development) countries. Mendoza *et al.* (1994) conclude that tax mix has no significant effect on growth.

Most of the studies in the literature have been centered on the overall effects of taxes on economic growth. However, the converse relationship has not been thoroughly considered (Tosun and Abizadeh, 2005). The aim of this study is to investigate long-run equilibrium relationship between overall tax revenues and economic growth in Turkey using the bounds test to level relationship, which was recently developed by Pesaran *et al.* (2001) and Johansen approach for cointegration. The great majority of government revenues in Turkey come from tax revenues, where they were 7.3% of GDP in 1960, 11.6% in 1980 and 24.2% in 2006 (TURKSTAT, 2006). Effective taxation is important for economic policies. However, it is not possible to talk about successful implementation of taxation policies in Turkey when they are considered since the beginning years of the republic. Over the last decade, Turkey`s economic performance has been weakened by fiscal inadequacies, which has led to macroeconomic instability over the years (Binay, 2003). Thus, studying this issue for Turkey deserves further attention from researchers.

The paper proceeds as follows. Section II defines data and methodology of the study. Section III provides results and discussions, and the paper concludes with Section IV.

2. Data and Methodology

Data used in this paper are annual figures covering the period 1960 – 2006 and variables of the study are real GDP and real tax revenues (total tax revenues including direct and indirect taxes). Data were gathered from World Bank Development Indicators (World Bank, 2008) and Turkish Institute of Statistics (TURKSTAT, 2008) in Turkey. Both variables are at 2000 constant US $ prices and in the natural logarithm.

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP)[1] Unit Root Tests are employed to test the integration level and the possible long run relationship among the variables (Dickey and Fuller, 1981; Phillips and Perron, 1988). The PP procedures, which compute a residual variance that is robust to auto-correlation, are applied to test for unit roots as an alternative to ADF unit root test.

To investigate long-run relationship between each pair of variables under consideration, the bounds test for co-integration within ARDL (the autoregressive distributed lag) modeling approach was mainly adopted in this study. This model was developed by Pesaran et al. (2001) and can be applied irrespective of the order of

[1] *PP approach allows for the presence of unknown forms of autocorrelation with a structural break in the time series and conditional heteroscedasticity in the error term.*

integration of the variables (irrespective of whether regressors are purely I (0), purely I (1) or mutually co-integrated). The ARDL modeling approach involves estimating the following error correction models:

$$\Delta \ln Y_t = a_{0_Y} + \sum_{i=1}^{n} b_{i_Y} \Delta \ln Y_{t-i} + \sum_{i=0}^{n} c_{i_Y} \Delta \ln X_{t-i} + \sigma_{1_Y} \ln Y_{t-1} + \sigma_{2_Y} \ln X_{t-i} + \varepsilon_{1t} \quad (1)$$

$$\Delta \ln X_t = a_{0_X} + \sum_{i=1}^{n} b_{i_X} \Delta \ln X_{t-i} + \sum_{i=0}^{n} c_{i_X} \Delta \ln Y_{t-i} + \varpi_{1_X} \ln X_{t-1} + \varpi_{2_X} \ln Y_{t-i} + \varepsilon_{2t} \quad (2)$$

In equations (1) and (2), Δ is the difference operator, Y_t is the log of dependent variable, X_t is the log of independent variable and ε_{1t} and ε_{2t} are serially independent random errors with mean zero and finite covariance matrix.

Again in equations (1) and (2), the F-test is used for investigating a level (long-run) relationships. In the case of a long-run relationship, the F-test indicates which variable should be normalized. In Equation (1), when Y is the dependent variable, the null hypothesis of no level relationship is H_0: $\sigma_{1Y} = \sigma_{2Y} = 0$ and the alternative hypothesis of level relationship is H_1: $\sigma_{1Y} \neq \sigma_{2Y} \neq 0$. On the other hand, in Equation (2), when X is the dependent variable, the null hypothesis of no level relationship is H_0: $\varpi_{1X} = \varpi_{2X} = 0$ and the alternative hypothesis of level relationship is H_1: $\varpi_{1X} \neq \varpi_{2X} \neq 0$.

In addition to the bounds test to level relationship between real GDP and real tax revenues, Johansen trace test for cointegration was alternatively employed in this study for comparison purposes (Johansen, 1988; Johansen and Juselius, 1990). Cheung and Lai (1993) mention that the trace test is more robust than the maximum eigen value test for cointegration. The Johansen trace test attempts to determine the number of cointegrating vectors among variables. There should be at least one cointegrating vector for a possible cointegration. The Johansen (1988) and Johansen and Juselius (1990) approaches also allow the estimating of all possible cointegrating vectors between the set of variables and it is the most reliable test to avoid the problems which stems from Engel and Granger (1987) procedure[2].

3. Empirical Results

Table 1 gives ADF and PP unit root test results for real GDP and real tax revenues in Turkey. Both tests reveal that these variables are non-stationary at level but stationary at first difference, that is, they are integrated of order one, I(1). The null hypotheses of having unit root cannot be rejected neither in ADF nor PP tests at the level form of variables but can be rejected at their first differences.

Table 1

ADF and PP Tests for Unit Root

Statistics (Levels)	ln GDP	Lag	ln Tax	lag
τ_T (ADF)	-2.51	(0)	-1.11	(1)

[2] *See Kremers* et al. *(1992) and Gonzalo (1994) for the comments about disadvantages of Engel and Granger (1987) procedure compared with Johansen and Juselius (1990) cointegration technique.*

τ_μ (ADF)	-0.92	(0)	0.11	(1)
τ (ADF)	7.36	(0)	4.32	(1)
τ_T (PP)	-2.51	(0)	-1.69	(2)
τ_μ (PP)	-0.98	(3)	-0.18	(2)
τ (PP)	7.84	(1)	4.62	(3)
Statistics (First Differences)	Δln GDP	Lag	Δln Tax	lag
τ_T (ADF)	-7.46*	(0)	-9.13*	(0)
τ_μ (ADF)	-7.44*	(0)	-9.21*	(0)
τ (ADF)	-2.01**	(1)	-0.93	(4)
τ_T (PP)	-7.47*	(2)	-9.13*	(1)
τ_μ (PP)	-7.44*	(1)	-9.16*	(2)
τ (PP)	-4.00*	(4)	-7.04*	(4)

Note: GDP represents real gross domestic product of Turkey; Tax is total tax revenues (direct and indirected) in constant prices. τ_T represents the most general model with a drift and trend; τ_μ is the model with a drift and without trend; τ is the most restricted model without a drift and trend. Numbers in brackets are lag lengths used in ADF test as determined by AIC) to remove serial correlation in the residuals. When using PP test, numbers in brackets represent Newey-West Bandwith (as determined by Bartlett-Kernel).

** denotes rejection of the null hypothesis at the 1% level. Tests for unit roots have been carried out in E-VIEWS 5.1.*

Now, long-run equilibrium relationship between real GDP and tax revenues will be investigated by using the bounds test for level relationship within ARDL modeling approach. Table 3 gives results of the bounds test for level relationship between real GDP and agriculture in Turkey under three different scenarios as also suggested by Pesaran et al. (2001: 295-296), that are with restricted deterministic trends (F_{IV}), with unrestricted deterministic trends (F_V) and without deterministic trends (F_{III}). Intercepts in these scenarios are all unrestricted[3]. Critical values for F and t statistics are presented in Table 2 as taken from Pesaran et al. (2001) to be used in this study.

Table 2

Critical Values for ARDL Modeling Approach

	0.10		0.05		0.01	
k = 2	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
F_{IV}	3.38	4.02	3.88	4.61	4.99	5.85
F_V	4.19	5.06	4.87	5.85	6.34	7.52
F_{III}	3.17	4.14	3.79	4.85	5.15	6.36
t_V	-3.13	-3.63	-3.41	-3.95	-3.96	-4.53
t_{III}	-2.57	-3.21	-2.86	-3.53	-3.43	-4.10

Source: Pesaran et al. (2001): pp. 300-301 for F-statistics and pp. 303-304 for t ratios.
Note: k is the number of regressors for dependent variable in ARDL models, F_{IV} represents the F statistic of the model with unrestricted intercept and restricted trend, F_V represents the F statistic of the model with unrestricted intercept and trend, and F_{III} represents the F statistic of

[3] *For detailed information, please refer to Pesaran* et al. *(2001), pp. 295-296.*

the model with unrestricted intercept and no trend. t_V and t_{III} are the t ratios for testing $\sigma_{1Y} = 0$ in Equation (1) and $\varpi_{1Y} = 0$ in Equation (2) respectively with and without deterministic linear trend.

Results in Table 3 suggest that the application of the bounds F-test using ARDL modeling approach does not suggest the existence of a level relationship (long-run relationship) between real GDP and tax revenues when both real GDP and taxes are dependent variables since the null hypotheses of H_0: $\sigma_{1Y} = \sigma_{2Y} = 0$ and H_0: $\varpi_{1Y} = \varpi_{2Y} = 0$ cannot be rejected according to F_{III}, F_{IV} and F_V scenarios. On the other hand, the results from the application of the bounds t-test in each ARDL model do not even allow the imposition of the trend restrictions in the models since they are not statistically significant (See Pesaran *et al.,* 2001: 312). To summarize, long-run equilibrium relationship has not been found between taxation and growth in the case of Turkey according to the bounds tests.

Table 3

Bounds Test for Level Relationships

	With Deterministic Trends			Without Deterministic Trend		
Variables	F_{IV}	F_V	t_V	F_{III}	t_{III}	Conclusion H_0
GDP and Tax						
F_{GDP} (GDP / Tax)	2.13a	1.98a	-1.92a	1.67a	-0.77a	Accepted
F_{Tax} (Tax / GDP)	2.54a	2.17a	-0.88a	2.41a	-0.67a	Accepted

Note: Akaike Information Criterion (AIC) and Schwartz Criteria (SC) were used to select the number of lags required in the co-integration test. Both gave the same level of lag order, VAR= 1. F_{IV} represents the F statistic of the model with unrestricted intercept and restricted trend, F_V represents the F statistic of the model with unrestricted intercept and trend, and F_{III} represents the F statistic of the model with unrestricted intercept and no trend. t_V and t_{III} are the t ratios for testing $\sigma_{1Y} = 0$ in Equation (1) and $\varpi_{1Y} = 0$ in Equation (2) respectively with and without deterministic linear trend. [a] indicates that the statistic lies below the lower bound.

Table 4

Cointegration Tests based on the Johansen (1988) and Johansen and Juselius (1990) Approach

Variables	Trace Statistic	5% Critical Value	1% Critical Value
VAR lag: 1			
GDP and Tax			
H_0: r = 0	2.37	15.41	20.04
H_0: r ≤ 1	0.18	3.76	6.65
VAR lag: 2			
GDP and Tax			
H_0: r = 0	3.45	15.41	20.04
H_0: r ≤ 1	0.26	3.76	6.65
VAR lag: 3			
GDP and Tax			

Variables	Trace Statistic	5% Critical Value	1% Critical Value
H_0: r = 0	3.75	15.41	20.04
H_0: r ≤ 1	0.15	3.76	6.65
VAR lag: 4			
GDP and Tax			
H_0: r = 0	4.62	15.41	20.04
H_0: r ≤ 1	0.67	3.76	6.65

NOTE: r denotes the number of cointegrating vectors.

In addition to the bounds test to level relationship between real GDP and tax revenues in Turkey, cointegration test using Johansen approach was also considered in this study as mentioned before. There are methods for lag length selection in the recent literature such as AIC (Akaike Information) and SIC (Schwartz Information Criterion). Pindyck and Rubinfeld (1991) pointed out that it would be best to run the test for a few different lag structures and make sure that the results were not sensitive to the choice of lag length. Thus, although optimum lag order is one according to both AIC and SIC, alternative lag orders were tested in this study for Johansen approach. Johansen trace test results in Table 4 show that no cointegration exists between real GDP and tax revenues in Turkey since trace statistics are not statistically significant; therefore, the null of having no cointegrating vector cannot be rejected in any lag order. It is clearly seen that the results of the bounds test and Johansen approach for cointegration are consistent that long-run equilibrium relationship does not exist between real GDP and tax revenues in Turkey. It is useful to mention that none of the three scenarios suggested by Pesaran et al. (2001) confirmed cointegration between tax revenues and real GDP and this finding was also confirmed by Johansen cointegration technique. Finally, since no cointegration exists between taxation and real GDP, further investigation such as error correction modeling and/or Granger causality tests cannot be preceded as a long-run equilibrium investigation.

4. Conclusions

This paper empirically conducts tests to see if there is long-run equilibrium relationship between real GDP growth and tax revenues growth in Turkey by using the bounds test and Johansen technique for cointegration. Results suggest that long-run equilibrium relationship between economic growth and taxation cannot be inferred in the case of Turkey since both the bounds and Johansen tests do not confirm the existence of any long run equilibrium relationship between taxation and economic growth (real GDP growth). Thus, further investigation cannot be preceded between these two variables in the case of the Turkish economy.

Many economists might agree that high tax rates are bad for economic growth. However, Engen and Skinner (1996) propose that lower taxes have modest positive effects on economic growth, which can contribute to substantial differences in the level of economic activity and living standards, particularly over the long term.

Turkey's economic performance has been weakened by fiscal inadequacies over the last decade (Binay, 2003). Turkey's poor economic performance was not only because of weak economic policies but also because of the lack of strong governments for many years. This reality prevented the implementation structural measures, which in turn gave rise to myopic policies (Binay, 2003). Turkey attempted to stabilize the economy with monetary programmes by International Monetary Fund agreements in the 1990s. It is essential that effective coordination between fiscal and monetary policy should be arranged in the countries. Otherwise, poor or inappropriate fiscal policies can also damage the credibility of monetary policy. Turkey started to implement strong fiscal programmes only at the end of 1990s (Binay, 2003). In addition to income inequality in Turkey, taxation is also not transparent in the economy. The main source of tax revenues in Turkey is paid employees. Private sector needs to be encouraged in the Turkish economy in paying taxes regularly. This should also be done in order to prevent underground economic activities. Sustained contribution of taxation to the economy of Turkey seems to be possible only if black economy can be controlled and private sector can be encouraged for tax duties. Further research can be conducted to investigate the impact of tax components on economic growth performance of Turkey.

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