

Determining the Exogeneity of Tax Components with Respect to GDP

Cengiz ARIKAN¹
Yeliz YALCIN²

¹Ministry of Customs and Trade, 06510 Ankara, Turkey

Phone: ++90 312 449 3861 , E-mail: C.Arikan@gtb.gov.tr

²Department of Econometrics, Gazi University, 06500 Ankara, Turkey

Phone: ++90 312 216 1304, Fax: ++90 312 213 2036, E-mail: yeliz@gazi.edu.tr

Abstract *In this study we examine the relationship between tax revenues and GDP for Turkey for the period from 2004.Q1 to 2012.Q1. The effectiveness of tax components on GDP are investigated by using Johansen and Juselius (1990) cointegration and Granger Causality test. According to our findings, the main categories of taxes are cointegrated with GDP but the sub categories are not. This results means that more than optimal level of tax is collecting in some sub categories. When determined these sub categories, we have found as result that policy makers should increase Withholding Income Tax. When consider Special Consumption Tax, except Tobacco and Alcohol Products' SCT, all categories of Special Consumption Tax should be increased.*

Key words Taxation, GDP Growth, Fiscal Policy, Tax Components

DOI: 10.6007/IJARAFMS/v3-i3/151

URL: <http://dx.doi.org/10.6007/IJARAFMS/v3-i3/151>

1. Introduction

Tax is collected from tax-payers and individuals to cover government expenditure and public investment expenditures. To perform public activities, tax has been using as an economic source. And this source transfer to economy again by expenditure tool. For instance, tax and government expenditure affect both individuals and economic units' economic structure, distribution of income and economic units' demand and supply.

Economic growth can be defined as steady increase of reel GDP. In other words economic growth expresses the increases in goods and services. This increase directly or indirectly makes tax revenue to be increased. In economic literature economic growth is represented by two basic models. According to exogenous growth model, economic growth is determined outside the system. It is affected from technological progress whereas there is no effect of government policy on it. According to this information tax has no effect according to exogenous growth model. As regards to endogenous growth model, not only tax rate but also tax composition has effects on economic growth. To maintain long run economic stability endogenous growth model can be used because it corrects Non-Pareto optimality states (Arisoy and Unlukaplan, 2010).

In the economic literature there is a discussion about how tax revenue and rates effect the economic growth. To ensure stable economic growth which level of tax should be put into force by policy makers? Because, fiscal policy as well as tax is used as an economic tool to ensure stable economic growth. Tax has impact as burden on economic growth, development, savings, consumption and other economic variables. That's why these effects cause a shrink on economy when the tax burden gets higher. Tax incentives for

* The views in the study are those of author. They do not necessarily reflect the official position of Ministry of Customs and Trade and its staff. Authors would like to thank Hakan Berument and the members of the Pazar XI discussion group for their helpful comments and suggestions.

special sectors or areas, putting high tax rates to protect some sectors areas, import taxes to protect domestic producers can be shown as examples of tax policies. By changing tax rates or some laws about tax, policy makers control the sectors as well as areas and domestic producers directly or indirectly.

And another discussion about tax is which tax revenue should be increase or should be collected mostly. According to tax nature, tax is collected to eliminate income injustice as a social phenomenon. It can be shown that tax is paid according to taxpayer's income so it is a sign of justice. However, avoid tax awareness and tax evasion cause justice principle being infringed and this situation causes social injustice to be revealed.

This paper proceeds as follows: In the first section literature examples are given. In the second section of this study the theoretical structure of tax and tax types that are used in Turkey are given. In addition, the relationship between economy and tax revenues is mentioned in the first section. In the following section of the study the data set is defined and estimation results are discussed. In the last part, conclusions are given.

2. Literature review

Applying the fiscal policy has three main aims. These are, economic stabilization, recovering the distribution of income and economic growth. To determine the fiscal policy effectiveness there are several studies about on the subjects of taxation and economic growth in the literature. Vedder (2001) finds that high tax rates cause recession in economy for 50 states in USA for the period 1957 to 1997. Anastassiou and Dritsaki (2005) investigate the relation between tax revenue and economic growth for Greece. Their empirical findings indicate that there is one way causality from tax revenue to economic growth. Tosun and Abizadeh (2005) have researched the changes in the tax mix of OECD countries in response to economic growth. According to their results, personnel income tax and corporate tax are the most effective taxes on economic growth negatively. Duc (2009)'s study evaluates the relationship among direct and indirect tax revenue, government expenditure and GDP for Japanese economy. According to findings each variable has cointegration with another and there is long run causality from GDP to tax revenue, based on VECM, and also this causality is statically significant. Moreover, according to results, while direct tax does not affect GDP significantly, indirect tax is statistically significant Granger cause of GDP in both long and short run. By applying ARDL models Scarlett (2011) have examined the impacts of taxation on economic growth for Jamaica. Increasing indirect tax revenues, especially GCT (General Consumption Tax) on imports result economic growth in long run whereas SCT (Special Consumption Tax) more effective on economic growth in short run. Aamir et. all (2011) have investigated the effects of indirect taxes and direct on economic growth for Pakistan and India. Although, increasing indirect tax revenue is more effective in Pakistan, direct tax revenue is more effective in India for these countries' economies. Ormaechea and Yoo (2012) investigate the relation between changes in tax composition and long-term economic growth using the dataset during the period from 1970 to 2009 for 69 countries by applying Error Correction Model. They find that increasing income taxes while reducing consumption and property taxes is associated with slower growth over the long term as result.

Policy makers use some policy instruments like fiscal policy, debt policy and expenditure policy to ensure economic growth. No doubt, debt policy must be last choice for stable economic growth. Fiscal policy has being used in Turkey like many other developing countries to ensure economic growth. Many studies have been conducted to investigate the effectiveness of current fiscal policy. Durkaya and Ceylan (2006) use the Granger Causality and Vector Error Correction Models to determine the short term relations between direct tax and economic growth. According to their findings there is two way causality between direct tax and economic growth to each other. Yilmaz and Tezcan (2007) investigate the relations between tax revenue, fixed capital investment and economic growth by using Johansen Cointegration Test and Granger Causality for the period from 1980 to 2005 annual data. They find that there are long term and positive relations between variables. Temiz (2008) determines the relation between total tax revenue, indirect tax revenue, direct tax revenue and GDP for the period 1960 -2006, employing Johansen Cointegration and Error Correction Model. They report the total tax revenue and GDP have long term relation. Mucuk and Alptekin (2009) have investigated the direct and indirect taxes' effect on economic growth for Turkey by applying VAR methods. According to tests results, there is a cointegration between variables and there is one way direction causality from indirect tax to economic growth. Arisoy and Unlukaplan (2010) have analyzed the effect of direct-

indirect tax composition on economic growth for Turkey. According to their findings, real output is positively related to indirect tax revenue whereas direct tax revenue has no significant effect. Conducting the long run equilibrium relationship between real GDP growth and tax revenue for Turkey is the aim of Katircioglu (2010) study's aim. According to bound and Johansen cointegration test results there is no long run equilibrium between taxation and economic growth as his finding.

In this study, we examine how the tax revenues growth effects GDP growth using total tax, direct tax, indirect tax and their components for Turkey from 2004 to 2012 using quarterly data. For this purpose, unlike the existing literature weak exogeneity of variables, total tax, direct tax, indirect tax and their components are tested with identification restriction on cointegration equation. Moreover, strong exogeneity of variables is tested employing Granger Causality test. Then, the effectiveness of tax components on GDP are investigated for all tax components.

3. Taxation System in Turkey

Taxation System in Turkey is a kind of multi tax system. There is no country in the world has single tax system. Turkish Tax System, tax forms comprise of three main category; taxes from income, taxes from expenditure and taxes from wealth. These categories taxes are shown in Figure 1.

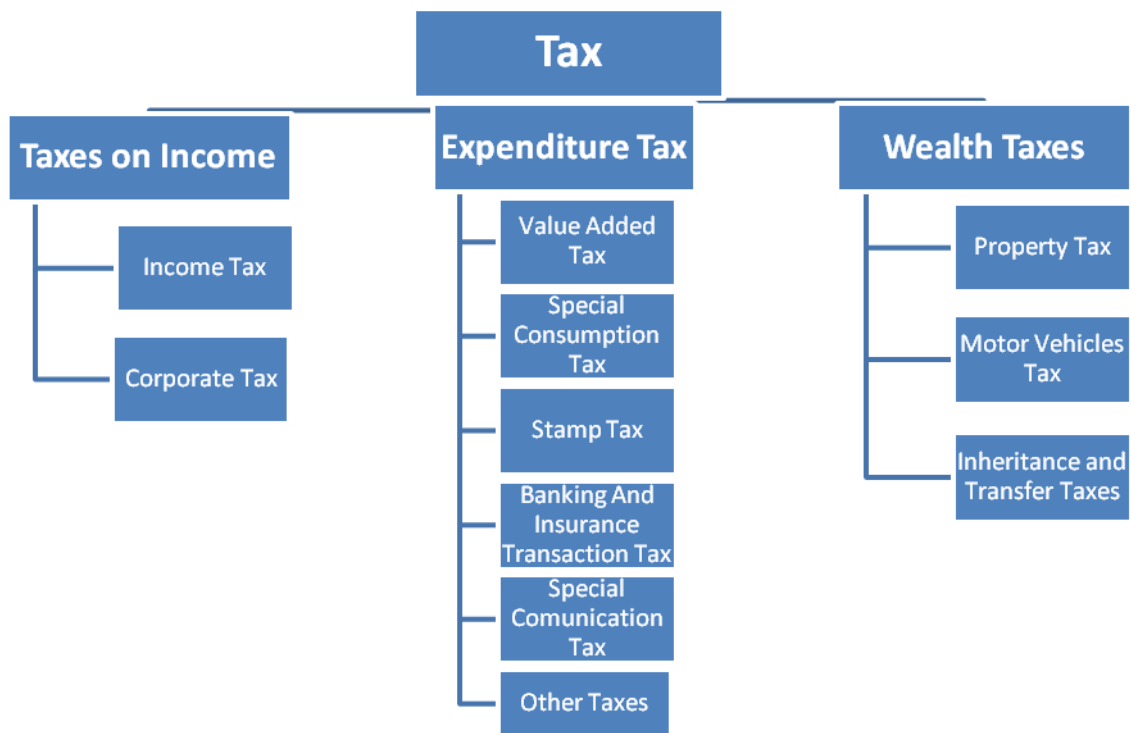


Figure 1. Current Tax Types in Turkey

According to reflection criteria, tax given from specified person, original taxpayer, and non-reflective or hard to reflection as a rule is called direct tax and tax which can reflect the tax burden to others is called indirect tax. Direct tax is more convenient to the principle of ability to pay. Especially, income tax is a kind of subjective tax because income tax considers taxpayers' individual, domestic and social situations.

On the other hand, indirect taxes are not suitable for ability-to-pay principle so do not contribute tax equity. Whether the contractor have the staying power of taxation or not is not considered. Because of not knowing taxpayers of indirect previously, indirect taxes are generally objective taxes.

Corporate Tax and Income Tax are two main taxes of Turkish direct taxation system. Income tax is subject to an individual's income and earning. Corporate tax is subject to a company's income and earning. Despite the fact that each is governed by a different legislation, Income Tax Law (1960), Corporate Tax Law (1949, revised

2006), many rules and provisions of the Income Tax Law also apply to corporations, especially, in terms of income elements and determination of net income¹.

Indicator of the level of development as well as other indicators direct and indirect tax burden can show development level of the country. In contrast to developing countries, direct tax burden is higher than indirect tax burden in developed countries. Indirect taxes in Turkey constitute a large amount of total tax revenues: their distribution in tax revenues are increasing day by day. Figure 2 and Figure 3 below depicts the evolution of tax types in total tax revenues in 2010 and 2011².

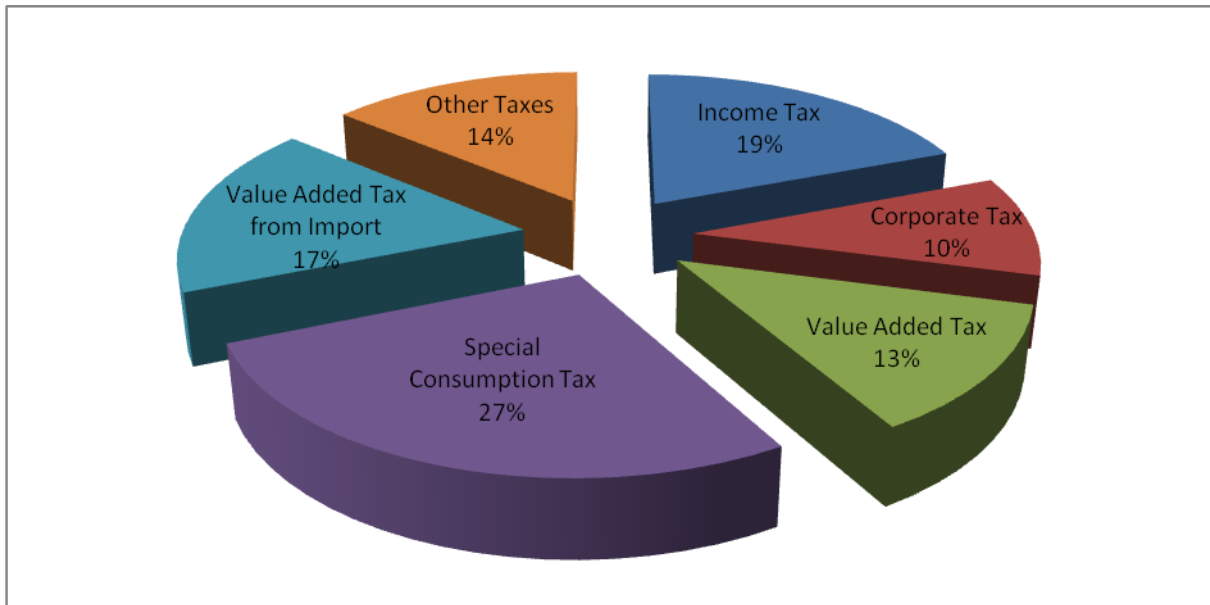


Figure 2. Type of Tax Revenues in 2010

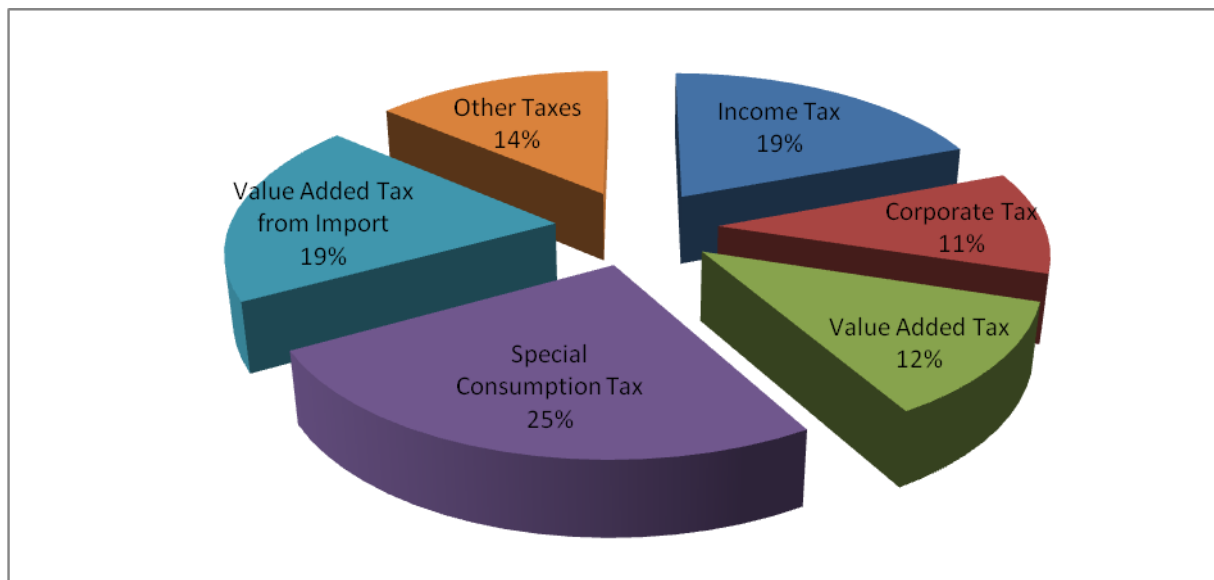


Figure 3. Type of Tax Revenues in 2011

¹ Tax Revenue Administration, www.gib.gov.tr (25.10.2012)

² Data is collected from General Directorate of Budget and Fiscal Control's December 2011 Realization Report <http://www.bumko.gov.tr/Eklenti/971,2011aralikayibutcegerceklesmeleriraporupdf.pdf?0> (21.10.2012)

Both in 2010 and in 2011 indirect tax revenues have large proportion in total tax revenues. Although, the ratio of Special Consumption Tax (SCT) and Value Added Tax (VAT) in total has decreased, the revenue of these taxes has increased. The tax revenues by types in 2011 compared to 2010 VAT on imports %34.5, corporate tax 29%, income tax 20.8%, domestic Value Added Tax (VAT) 13.8%, Special Consumption Tax (SCT) 12.1% and other taxes revenues 19.4% has increased³.

In order to fulfill the public activities, economic units collect tax and other similar meanings as revenue resources and by expenditure loop these resources are transferred to the economy through the expenditure again. Taxes and public spending make individuals and economic agents change economic structure. They also affect the income distribution in society and also change economic agents' demand and supply.

In Turkey, companies collect the indirect tax behalf of the state as tax responsible. While paying indirect taxes collected, tax payers deduct indirect tax which is paid by them from collected indirect taxes. If difference is positive (the collected indirect tax is greater than the paid indirect tax), difference is paid to tax administration. If it is negative (the collected indirect tax is smaller than the paid indirect tax), difference deduct in the next periods operations. However, while paying indirect tax, tax payers sense that this is an amount from their budget and so they make attempts not to pay (cost upgrades, hide sales etc.). According to a study conducted by the Tax Inspectors Board in 2004, VAT trafficking forms 3.5% of GDP.

4. Methodology and Empirical Results

Analyzing the relationship between tax revenues and GDP is the purpose of this study. To capture these effects long term relation should be searched out. Therefore, Johansen and Juselius (1990) cointegration analyze is conducted to determine the relation between tax components and GDP.

In this study, general budget statistics' tax components and Real Gross Domestic Products (GDP) data are collected from Turkey Ministry of Finance General Directorate of Public Accounts⁴ and the electronic data delivery system of the Central Bank of the Republic of Turkey⁵ for the period from 2004.Q1 to 2012.Q1⁶, respectively. Specified the detailed data are given in Table 1.

Table 1. Variables in the Study

Variable	Notation
Total Tax Revenue	Total
Direct Tax Revenue	Direct
Corporate Tax Revenue	Corporate
Income Tax Revenue	Income
Income Tax Based on Declaration Tax Revenue	BDIT
Simple Entry Income Tax Revenue	SEIT
Temporary Income Tax Revenue	TIT
Withholding Income Tax Revenue	WIT
Indirect Tax Revenue	Indirect
Value Added Tax Revenue	VAT
Special Consumption Tax Revenue	SCT
Oil And Natural Gas Products SCT	List1
Motor Vehicles SCT	List2
Alcoholic Beverages And Tobacco Products SCT	List3
Other Products SCT	List4
Gross Domestic Product	GDP

³ These ratios are calculated according to revenues.

⁴ www.muhasabat.gov.tr (01.09.2012)

⁵ www.evds.tcmb.gov.tr (01.09.2012)

⁶ Because of the data availability authors had to be chosen this period for the study.

Before beginning the analysis since the all series show seasonal pattern, they are adjusted with using Tramo Seats method. Then, logarithmic transformation is applied to all series. Second, the stationary properties of the logarithmic data and the order of integration of the data are tested by using the Augmented Dickey-Fuller (ADF, 1981), Phillips Perron (PP, 1988) and Kwiatkowski, Phillips, Schmidt and Shin (KPSS, 1992) tests for the model with trend and without trend. The null hypothesis of the ADF and PP tests is that a time series contains a unit root, while the KPSS test has the null hypothesis of stationary. The results of these tests for main tax groups and their components and GDP are given at Table 2. In Table 3 Income Tax and SCT components' unit root tests results are given

Table 2. The Results of ADF, PP and KPSS Unit Root Test for Seasonal Adjusted Series

Variable		Corporate	Direct	Income	Indirect	SCT	Total	Vat	Reel GDP
ADF	Level								
	Constant	-2.22	-1.96	-1.26	-1.43	-2.12	-1.84	-1.96	-1.18
ADF	Constant Trend	-5.605***	-3.271*	-7.922***	-1.639	-2.351	-2.517	-4.119**	-2.339
	First Difference	-8.619***	-8.336***	-2.965**	-4.269***	-7.626***	-4.377***	-10.680***	-4.231***
PP	Level								
	Constant	-1.91	-1.95	-2.06	-1.5	-2.09	-1.84	-1.62	-1.18
PP	Constant Trend	-6.284***	-3.268*	-0.1763	-2.037	-2.581	-2.384	-4.218**	-1.996
	First Difference	-24.431***	-8.702***	-5.441***	-4.426**	-7.379***	-4.367***	-11.359***	-4.178***
KPSS	Level								
	Constant	0.730***	0.692***	0.589***	0.610***	0.523***	0.674***	0.604***	0.659***
KPSS	Constant Trend	0.130**	0.150***	0.161***	0.088*	0.088*	0.098*	0.115*	0.096*
	First Difference	0.500**	0.219	0.252	0.097	0.123	0.146	0.500**	0.105

***, **, * statistically significant at the 10%, 5%, 1% level, respectively

Table 3. The Results of ADF, PP and KPSS Unit Root Test for Seasonal Adjusted Components

			Income tax Components						S&I Components				
ADF	Level	Constant	Based on Declaration Income Tax (BDIT)	Simple Entry Income Tax (SEIT)	Temporary Income Tax (TIT)	Withholding Income Tax (WIT)	Oil and Natural Gas Products (List1)	Motor Vehicles (List2)	Alcoholic Beverages and Tobacco Products (List3)	Other Products (List4)	Test Statistic	Constant	Trend
			Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic			
PP	Level	Constant	Based on Declaration Income Tax (BDIT)	Simple Entry Income Tax (SEIT)	Temporary Income Tax (TIT)	Withholding Income Tax (WIT)	Oil and Natural Gas Products (List1)	Motor Vehicles (List2)	Alcoholic Beverages and Tobacco Products (List3)	Other Products (List4)	Test Statistic	Constant	Trend
			Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic			
KPSS	Level	Constant	Based on Declaration Income Tax (BDIT)	Simple Entry Income Tax (SEIT)	Temporary Income Tax (TIT)	Withholding Income Tax (WIT)	Oil and Natural Gas Products (List1)	Motor Vehicles (List2)	Alcoholic Beverages and Tobacco Products (List3)	Other Products (List4)	Test Statistic	Constant	Trend
			Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic	Test Statistic			
	First Difference	Constant	-2.467	-11.972***	-4.125***	-2.078	-1.523	-2.192	-1.219	-1.469			
		Constant Trend	-3.894**	-13.636***	-4.212**	-1.859	-2.447	-2.488	-2.705	-1.801			
		Constant	-6.887***	-11.963***	-8.735***	-5.936***	-6.461***	-3.578**	-9.780***	-4.728***			
		Constant	-2.348	-9.479***	-4.097***	-2.074	-1.523	-1.757	-1.732	-1.534			
		Constant Trend	-3.549*	-10.724***	-4.197**	-1.894	-2.437	-1.868	-4.528***	-1.801			
	First Difference	Constant	-13.550***	-12.431***	-17.437***	-5.929***	-6.461***	-3.673***	-11.485***	-4.711***			
		Constant	0.694**	0.619**	0.303	0.579**	0.523**	0.223	0.675**	0.486**			
		Constant Trend	0.111	0.175**	0.145*	0.162**	0.105	0.113	0.097	0.092			
	First Difference	Constant	0.384*	0.519***	0.313	0.253	0.075	0.111	0.164	0.098			

***, **, * statistically significant at the 10%, 5%, 1% level, respectively

According to unit root tests results, in general, for all variables the unit root null hypothesis cannot be rejected at 5% significance level except SEIT and TIT. Next in order to examine whether there is a long term relationship between real GDP and the tax components, Johansen and Juselius (1990) methodology is used. The Johansen cointegration analysis is conducted for intercept and without trend and also with intercept and trend model. Since the trace statistics and the maximum Eigen value statistics may yield conflicting results, we use both the trace and maximum Eigen value type cointegration tests in this study. We have determined the

appropriate lag length for the level VAR according to AIC while maximum lag length is 8. The cointegration test results are given in Table 4.

Table 4. Cointegration Test Results for Main Tax Categories

	Lag Length	Number of Cointegration			
		Trace Statistics		Max-Eigen statistic	
		None	At Most One	None	At Most One
Real GDP and Corporate ^(b)	1	25.171 (0.061)	5.984 (0.462)	19.187 (0.053)	5.984 (0.462)
Real GDP and Direct ^(b)	5	45.232 * (0.000)	10.217 (0.118)	35.014* (0.000)	10.217 (0.118)
Real GDP and Income ^(b)	5	34.271* (0.004)	11.524 (0.073)	22.747* (0.016)	11.524 (0.073)
Real GDP and Indirect ^(b)	1	27.771* (0.028)	7.949 (0.256)	19.821* (0.043)	7.949 (0.256)
Real GDP and SCT ^(b)	1	20.779 (0.189)	7.021 (0.342)	13.758 (0.271)	7.021 (0.342)
Real GDP and Total ^(a)	1	18.771* (0.015)	2.342 (0.126)	16.429* (0.022)	2.342 (0.126)
Real GDP and VAT ^(b)	4	25.936* (0.049)	10.523 (0.105)	15.413 (0.172)	10.523 (0.105)
(a) : Cointegration is determined according to Intercept Cointegration (b) : Cointegration is determined according to Intercept and Trend Cointegration * Statistically significant at the 5% level (p value in parentheses).					

According to tests results, there is a statistically significant cointegration vector between Direct Tax and GDP, Income Tax and GDP, Indirect Tax and GDP, Total Tax and GDP and VAT and GDP at 5% level. When compared the results existing literature, our findings are partly parallel. Keho (2010) have found that tax variables except direct tax and real GDP are cointegrated and positively related in the long run for Côte d'Ivoire. The paper by Temiz (2008) have investigated for Turkey and found that total tax revenue and GDP have long run relations. In addition, according to Mucuk and Alptekin (2009) study for Turkey there is a cointegration between direct tax, indirect tax and economic growth. However, Katircioglu (2010) could not found any long run equilibrium between taxation and economic growth for Turkey.

For valid inference on the parameters, the concept of the exogeneity of variable is important. Invalid exogeneity assumptions may lead to inefficient or inconsistent inferences and forecasts for policy makers. Weak exogeneity is introduced by Engle, Hendry and Richard (1983) as a sufficient condition in a framework of I(0) variables or in a cointegrated systems. The cointegrating exogeneity implies that long-run relations are block triangular; therefore it means no long-run feedback of tax variables onto related VECMs.

For illustration, when consider the Y_t as a GDP and the X_t as a tax. Two variable p-order vector error correction model is given as follows:

$$\Delta Y_t = \alpha_1 \beta' Y_{t-1} + \sum_{i=1}^{p-1} \phi_{1i} \Delta Y_{t-i} + \sum_{i=1}^{p-1} \gamma_{1i} \Delta X_{t-i} + \varepsilon_{1t} \tag{1}$$

$$\Delta X_t = \alpha_2 \beta' X_{t-1} + \sum_{i=1}^{p-1} \phi_{2i} \Delta X_{t-i} + \sum_{i=1}^{p-1} \gamma_{2i} \Delta Y_{t-i} + \varepsilon_{2t} \tag{2}$$

Where α_i and β are loading coefficients and the cointegration vectors respectively. And α_i speed of adjustment parameter. At least one of the α_i should be statistically significant for long term relations. The null hypothesis of the weak exogeneity is a restriction on loading matrix. That is, under the assumption of the tax is weak exogeneity, the restriction on loading matrix is $H' = [1 \ 0]$. The results of weak exogeneity are given in Table 5.

Table 5. Exogeneity Test Results

	Lag Length	Weak Exogeneity of GDP ($H^0=[0 \ 1]$)	Weak Exogeneity of TAX ($H^0=[1 \ 0]$)
Reel GDP and Direct ^(b)	5	3.8177* (0.0507)	12.6091*** (0.0004)
Reel GDP and Total ^(a)	1	6.2985** (0.0121)	0.8260 (0.3634)
Reel GDP and VAT ^(b)	4	4.8358** (0.0279)	0.4037 (0.5252)
Reel GDP and Income ^(b)	5	11.2027*** (0.0008)	1.1762 (0.2781)
Reel GDP and Indirect ^(b)	1	5.4658** (0.0194)	11.0781*** (0.0009)
(a) : Cointegration is determined according to Intercept Cointegration (b) : Cointegration is determined according to Intercept and Trend Cointegration * ** *** statistically significant at the 10%, 5%, 1% level, respectively. (p values in parenthesis)			

According to weak exogeneity test results at 5% significance level when consider GDP and tax components together, total tax, VAT and income tax are weakly exogenous with respect to GDP. But when consider direct tax and GDP and also indirect tax and GDP, GDP is weakly exogenous with respect to tax types. To determine strong exogeneity, the Granger Causality and the weak exogeneity should be checked together. Granger Causality test are employed for weak exogenous variables and the results are given in Table 6.

Table 6. Granger Causality Test Results

Null Hypothesis	Chi Square Statistics
The Total Tax Does Not Granger Cause The Real GDP	9.1861*** (0.0024)
The Direct Tax Does Not Granger Cause The Real GDP	5.1336 (0.3998)
The Income Tax Does Not Granger Cause The Real GDP	41.5128*** (0.0000)
The Indirect Tax Does Not Granger Cause The Real GDP	20.0966*** (0.0000)
The VAT Does Not Granger Cause The Real GDP	16.4941*** (0.0024)
The Real GDP Does Not Granger Cause The Total Tax	0.0662 (0.7969)
The Real GDP Does Not Granger Cause The Direct Tax	28.1566*** (0.0000)
The Real GDP Does Not Granger Cause The Income Tax	3.6986 (0.5936)
The Real GDP Does Not Granger Cause The Indirect Tax	6.3993** (0.0114)
The Real GDP Does Not Granger Cause The VAT	2.2685 (0.2249)
*, **, *** indicate the series is Granger Causality at the 10%, 5%, 1% level, respectively. p values in parenthesis	

According to Granger Causality tests results, Real GDP does not Granger cause total tax, VAT and income tax individually at 5% significant level. Also, direct tax does not Granger Cause the Real GDP at 5% significance level. When we consider weak exogeneity test and Granger Causality test simultaneously, total tax, VAT and income tax are strong exogenous with respect to GDP at 5% significant level. In contradistinction to these results, GDP is also strong exogeneity at 5% level with respect to Direct Tax.

These results show that, when main categories of taxes have cointegration but its sub-categories do not have cointegration more than optimal level of tax are collecting in some sub-categories. When compared the findings with recent studies about taxation and economic growth, our findings are related the existing literature. Anastasiou and Dritsaki (2005) have found that there is one way causality from tax revenue to economic growth for Greece Economy. These findings are also parallel to Duc (2009) study, analyzed for Japanese Economy.

To determine accruals of tax components with respect to GDP we use Johansen and Juselius (1990) cointegration method for nonstationary tax categories. Cointegration is determined according to intercept and trend cointegration. The trend coefficients in the models capture tax components' growth rate with respect to GDP. Negative trend coefficient means that the tax component revenue has reached the maximum amount that can be collected. If policy makers continue to collect this tax GDP begin to decrease. The positive coefficient means that policy makers should take measures to increase this tax types. By this methodology we get accruals of tax components in accordance with GDP. The trend coefficients and the t statistics are given at Table 7.

Table 7. Trend Coefficients for Main Tax Categories

	Trend	t Statistic
Total	-0.0010	1.228
Direct	0.005	3.712***
Corporate	-0.042	-3.798***
Income	0.007	5.904***
Indirect	0.005	3.816***
VAT	-0.008	-2.073**
SCT	0.007	4.098***

***, ** statistically significant at the 10%, 5%, 1% level, respectively

Table 7 shows tax type's accruals in terms of GDP. In some sub categories tax revenues increases slowly in some sub categories tax revenue increase rapidly than GDP. All the trend coefficients in the equations are statistically significant at 5% level except total tax. These insignificant coefficients are supporting the cointegration test results because only total tax is estimated without trend at cointegration test. This case means that tax revenues has reached its maximum level in heavy increased categories. Therefore, to increase slow increased groups tax revenues measures should be taken.

VAT taken from expenditure is a stable rate tax. It is changeable depends on product variability as 1%, 8% and 18%. Changing these rates and products is a long and tough process. Besides, it has concluded that the policies should be developed on SCT because of VAT revenues has reached its maximum level. Carried out Fiscal Policies are supporting the results.

Although, corporate tax has increased more rapidly than GDP, income tax so did ahead of GDP. Therefore, corporate tax has reached and income tax has not reached the maximum amount that can be collected, also the policies for increasing the income tax revenues should be taken.

In order to determine what kind of measures should be taken, the relationship between slowly increasing sub categories' (Income Tax and SCT) components and GDP are investigated. Johansen and Juselius (1990) methodology is applied to all non stationary series to examine whether there is a long term relationship between real GDP and the slowly increasing tax components. Test results are in Table 8.

According to tests results, all the series are cointegrated with GDP at 5% significance level.

Finally, for these sub categories how the sub categories affect the GDP, we interpret the trend coefficient in cointegration equation. The trend coefficients in the models capture tax components' growth rate with respect to GDP. If the coefficient is positive which means this tax revenue has not reached the maximum amount that can be collected, policy makers should take measures to enable stable economy. Hereby the results can lead policy maker to take measures to increase tax revenues. The test results are in Table 9.

Table 8. Cointegration Test Results for Slowly Increasing Tax Components

	Lag Length	Number of Cointegration			
		Trace Statistics		Max-Eigen statistic	
		None	At Most One	None	At Most One
Real GDP and BDIT ^(b)	5	40.555* (0.0004)	7.851 (0.2641)	32.704* (0.0003)	7.851 (0.2641)
Real GDP and WIT ^(b)	5	28.155* (0.0253)	9.557 (0.1487)	18.597 (0.0648)	9.557 (0.1487)
Real GDP and List1 ^(b)	8	45.293* (0.0001)	8.571 (0.2085)	36.722* (0.0001)	8.571 (0.2085)
Real GDP and List2 ^(b)	5	32.129* (0.0073)	12.069 (0.0593)	20.059* (0.0399)	12.069 (0.0593)
Real GDP and List3 ^(a)	3	18.934* (0.0145)	0.327 (0.567)	18.606* (0.0097)	0.327 (0.567)
Real GDP and List4 ^(b)	7	28.551* (0.0227)	5.169 (0.5723)	23.382* (0.0124)	5.169 (0.5723)

(a) : Cointegration is determined according to Intercept Cointegration
 (b) : Cointegration is determined according to Intercept and Trend Cointegration
 * Statistically significant at the 5% level. p value in parentheses

Table 9. Trend Coefficients for Slowly Increasing Tax Components

		Trend	t Statistic
Income Tax Components	BDIT	-0.008	-2.796*
	WIT	0.007	5.986*
Special Consumption Tax Components	List1	0.004	2.254*
	List2	0.009	12.964*
	List3	0.0001	0.057
	List4	0.005	6.157*

*, **, *** statistically significant at the 10%, 5%, 1% level, respectively

According to Table 9, except BDIT all tax components increase slower than GDP. All positive trend coefficients in the models are statistically significant at 5% level except List3 (Tobacco and Alcohol Products' SCT). According to trend coefficients to increase Income Tax revenues policy makers should increase WIT which is taken from employee. The trend coefficient of this series is statistically significant. Increasing taxes on employers (WIT) can cause GDP decrease because if taxes taken from employers increase, employers income will decrease. If this happens, individuals are going to spend less. So while taking measures policymakers should be careful on low-incomer.

Since SEIT and TIT series are stationary, regression model in below is applied for these series and trend coefficients are obtained.

$$\frac{GDP_t}{Total\ tax_t - Tax_t^i} = c + \beta \frac{Tax_t^i}{Total\ Tax_t - Tax_t^1} + \theta Trend + \epsilon_t \quad (3)$$

Regression model test results for SEIT and TIT are in Table 11.

Table 11. Regression Model Results for SEIT and TIT^(a)

Dependent Variable	Independent Variables	Coefficient	t Statistics	p Value	Model Results
$\frac{GDP_t}{Total Tax_t - SEIT_t}$	c	6.5824	30.510	0.0000***	R2=0.7298
	$\frac{SEIT_t}{Total Tax_t - SEIT_t}$	-447.616	-2.104	0.0439**	F=44.2205
	Trend	-0.0284	-5.9294	0.0000***	p=0.0000
$\frac{GDP_t}{Total Tax_t - TIT_t}$	c	7.4617	23.8787	0.0000***	R2=0.5928
	$\frac{TIT_t}{Total Tax_t - TIT_t}$	73.7447	0.2980	0.7677	F=24.2933
	Trend	-0.0423	-5.8305	0.0000***	p=0.0000
*, **, *** statistically significant at the 10%, 5%, 1% level, respectively					
(a) : The variables in the equations are stationary.					

Not only trend coefficients in both regression models, but also both models are statistically significant. The coefficients of independent variables should be checked to determine the accrual levels of tax components. The independent variable coefficient for SEIT model the coefficient is negative and statistically significant at 5% level. This means this tax is relied as sufficient amount so increasing this tax amount may cause GDP decrease. When consider TIT the coefficient of independent variable is positive and statistically insignificant even at 10% level. This means increasing this tax's collected amount do not cause any change at GDP.

When consider SCT components, policy makers should take measures to increase all SCT component revenues except List3. According to the statistically significance level, policy makers should take measures to increase SCT revenues first List2 which is taken from motor vehicles, then list4 which is taken from other product and then list1 which is taken from oil and gas product. These results are corresponded to nowadays Fiscal Policies.

While, there are many examples about tax revenue and GDP growth in literature, there are few studies about this study's subject but in fact there is no example completely related with this subject. In the existing literature there are a set of examples partly related to our subject. Aamir et. all (2011) have suggested that indirect tax revenue is more effective for Pakistan economy whereas direct tax revenue is more effective for India economy. However, according to Tosun and Abizadeh (2005) study, personnel income tax and corporate taxes are the most effective taxes on economic growth negatively. Our finding is parallel to Scarlett (201) study, applied for Jamaica Economy. Increasing GCT on imports result economic growth in long run whereas SCT is more effective on economic growth in short run. Nevertheless, our findings are opposite to Ormoechea and Yoo (2012) study applied to 69 countries. While we have found that increasing income tax cause economic growth, they have found that increasing income tax is associated with slower economic growth.

5. Conclusion

The purpose of this paper is analyzing the relationship between tax revenues and GDP growth. This paper analyses that to ensure stable GDP growth which kind of tax revenues should be increased. Seasonally adjusted quarterly data are used for the period 2004.Q1 to 2012.Q1. According to results some main categories of taxes have cointegration but its sub-categories do not have cointegration. It means that more than optimal level of tax is collecting in some sub-categories. The results show that income and SCT revenues should be increased rather than corporate and VAT because corporate and also VAT revenues have reached their saturation point. Taking this study a step further we determine how the sub categories of Income tax and SCT affect the GDP. According to results, policy makers should increase WIT and except Tobacco and

Alcohol Products' SCT all SCT component revenues. While taking measures on WIT which is taken from employee policymakers should be careful on low-incomer. Because WIT is taken from all individuals also in low-income level and also in high-income level. Increasing this tax may cause to decrease spending level of low-income level individuals rather than high-income level individuals. SCT results are corresponded to recent Turkish Fiscal Policies. According to the statistically significance level, motor vehicles' SCT, other products' SCT and oil and gas products' SCT should be increased.

References

1. Aamir, M., Quayuum, A., Nasir, A., Hassain, S., Khan, K.I (2011), Determinants of Tax Revenue Comparative Study of Direct Taxes and Indirect Taxes of Pakistan and India, *International Journal of Business and Social Sciences*, 2(19), pp. 171-178.
2. Akcaglayan, A. and Kayiran, M. (2010), Türkiye'de Kamu Harcamaları ve Gelirleri: Nedensellik İlişkisi Üzerine Bir Araştırma, *Eskişehir Osmangazi University İİBF Journal*, 5(2), pp. 129-146.
3. Anastassiou, T. and Dritsaki, C. (2005), Tax Revenues and Economic Growth: An Empirical Investigation for Greece Using Causality Analysis.
4. Arisoy, I. and Unlukaplan, I. (2010), Tax Composition and Growth in Turkey: An Empirical Analysis, *International Resaerch Journal of Finance and economics*, Issue 59, pp. 51-61.
5. Arslan, I. and Yaprakli, S. (2008), Banka Kredileri ve Enflasyon Arasındaki İlişki: Türkiye Üzerine Ekonometrik Bir Analiz(1983-2007), *Istanbul University Econometrics and Statistics Journal*, Number: 7, pp. 88-103.
6. Charemza, W.W., Deadman, D.F. (1993), *New Directions in Econometric Practice: General to Specific Modeling Cointegration and Vector Autoregression*, Aldershot, Hanst: Edward Elgar Publishing Limited, Cambridge.
7. Demircan, E.(2004), Vergilendirmenin Ekonomik Büyüme ve Kalkınmaya Etkisi, *Erciyes University IIBF Journal*, Number:21, pp. 97-116.
8. Dickey, D.A and Fuller, W.A. (1981), Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root, *Econometrica*, 49(4), pp. 1057-1072.
9. Duc M.A Nguyenn Cao (2009), Tax System Reforms in Japan: Lessons for Vietnam, *Japan Center for Economic Research*, <http://www.jcer.or.jp/eng/pdf/duc.pdf> (11.04.2013).
10. Durakaya, M. and Ceylan, S. (2006), Vergi Gelirleri ve Ekonomik Büyüme, *Maliye Journal*, Number 150, pp. 79-89.
11. Enders, W. (2004), *Applied Time Series Econometrics*, Second Edition, John Wiley Sons INC.
12. Engle, R. and Hendry, D. and Richard, J. (1983) Exogeneity, *Econometrica*, 51(2), pp. 277-304.
13. Engen, E. and Skinner, J. (1996), Taxation and Economic Growth, *National Tax Journal*, Vol. 49 no. 4, pp. 617-642.
14. Göcer, I., Mercan, M., Bulut, S. and Dam, M. (2010), Ekonomik Büyüme İle Vergi Gelirleri Arasındaki İlişki: Sınır Testi Yaklaşımı, Number 28.
15. Gul, E. and Kenar, B. (2009), Ab Ülkeleri ve Türkiye'de Vergi Gelirleri ile Ekonomik Büyüme İlişkisi: 1980 – 2008, *Suleyman Demirel University 1. International Davraz Congress Presentation*, Isparta.
16. Hecq, A., Palm, H.C. and Urbain, J-P, (2001), Separation, Weak Exogeneity and P-T Decomposition in Cointegrated VAR Systems with Common Features, *University Maastricht, Netherlands*.
17. Johansen, S., Juselius, K. (1990), Maximum Likelihood Estimation and Inference on Cointegration – with Applications to the Demand for Money, *Oxford Bulletin of Economics and Statistics* 52, pp. 169-210.
18. Katircioglu, S.T. (2010), Is There a Long Run Relationship Between Taxation and Growth: The Case of Turkey, *Romanian Journal of Economics Forecasting*, pp. 99-106.
19. Keho Y., (2010), Estimating the growth-maximizing tax rate for Cote d'Ivoire: Evidence and implications, *Journal of Economics and International Finance*, Vol. 2(9).
20. Kwiatkowski D., P. C. B. Phillips, P. Schmidt, and Y. Shin (1992): Testing the Null Hypothesis of Stationary against the Alternative of a Unit Root. *Journal of Econometrics* 54, pp. 159–178.
21. Mangir, F. And Ertugrul (2012), H.M, Vergi Yükü ve Ekonomik Büyüme İlişkisi: 1988-2011 Türkiye Örneği, *Maliye Journal*, Number: 162, January-July 2012, pp. 256-265.

22. Mucuk, M and Alptekin, V. (2009), Türkiye’de Vergi ve Ekonomik Büyüme İlişkisi: VAR Analizi (1975 - 2006), Maliye Journal, Number 155, pp. 159-174.
23. Ormaechea, S. and Yoo, J. (2012), Tax Composition and Growth: A Broad Cross Country Perspective, IMF Working Paper.
24. Phillips, P.C.B and P. Perron (1988), Testing for a Unit Root in Time Series Regression, Biometrika, 75, pp. 335–346.
25. Rault, C. (2011), Long term Strong Exogeneity, Economics Bulletin, Volume 31, No.1, pp. 1-8.
26. Romer, C. and Romer, D. (2007), The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks, American Economic Review, American Economic Association, vol. 100(3), pp. 763-801.
27. Scarlett, H.G. (2011), Tax Policy and Economic Growth in Jamaica, Bank of Jamaica Working Paper.
28. Temiz, D. (2008), Türkiye’de Vergi Gelirleri ve Ekonomik Büyüme İlişkisi 1960–2006 Dönemi, 2. National Economy Congress Presentation, İzmir.
29. Tosun, M.S and Abizadeh, S. (2005), Economic Growth and Tax Components: An Analysis of Tax Changes in OECD, Applied Economics, 37, pp. 2251-2263
30. Yardımcı, P. (2007), Türkiye’de İhracat-İthalat ve Ekonomik Büyüme Arasındaki İlişkilerin Bilgi Yayılımları Çerçevesinde Analizi: Johansen ve Pesaran Sınır Testi Uygulaması, 8.Turkey Econometrics and Statistics Congress Presentation, Malatya.
31. Yılmaz, F. and Tezcan, N. (2007), Vergi Hasılatı ve Sabit Sermaye Yatırımlarının Ekonomik Büyüme Olan Etkisi: Ekonometrik Bir İnceleme, 8.Turkey Econometrics and Statistics Congress Presentation, Malatya.
32. Algir, Ö. (2012), Ekonomik Büyüme, Kalkınma ve Vergilerle İlişkisi <http://www.ekonometrik.com/ekonomik-buyume-kalkinma-ve-vergilerle-iliskisi.html> (29.10.2012).
33. Moffatt, M., The Effect of Income Taxes on Economic Growth http://economics.about.com/cs/taxpolicy/a/taxing_growth.htm (19.10.2012).
34. TR Ministry of Finance, General Directorate of Budget and Fiscal Control, Monthly Budget Realization Report, December 2012 <http://www.bumko.gov.tr/Eklenti/971,2011aralikayibutcegerceklesmeleriraporupdf.pdf?0> (21.10.2012).
35. Vedder, R. (2001), Taxes and Economic Growth, Ohio University Press, http://heartland.org/sites/all/modules/custom/heartland_migration/files/pdfs/8711.pdf (25.10.2012).
36. Zakrajsek, E. Summer School in Financial Mathematics Lecture Notes, <http://www.fmf.uni-lj.si/finmath09/Cointegration.pdf> (10.11.2012).