

## THE DETERMINANTS OF TAX CAPACITY AND TAX EFFORT IN TURKEY FOR THE PERIOD OF 1984-2012

Emre ATSAN<sup>1</sup>

### Abstract

We cannot think that the tax revenues, which constitute the largest portion of public revenues, can be unlimitedly collected. Hence, it has been clearly seen that the efforts to collect the taxes unlimitedly have caused social problems and crises. The tax capacity, which is one of the ratios used for determining the taxable portion of income level of a country, is one of the generally accepted ratios. This limit varies depending on the countries and time period. In our study, by determining the methods that are used for calculating the tax capacity in our literature review, we aimed to calculate the tax burden and Turkey's tax capacity level between the years 1984 and 2012. As the dependent variables in our study, Tax Revenues / GDP was used and, as independent variables, Value Added of Agriculture (% of GDP), income per capita, population growth ratio, foreign trade percentage, annual GDP growth rates (%), corruption index, and the Bureaucracy Efficiency Index, annual GDP growth rate (%) data were used, and it was concluded that foreign trade influenced the tax capacity positively, while the agricultural value added had negative effect.

In our study, even though a generally balanced course is seen between actual tax burden and tax capacity from 1984 to 2012, it can be easily seen that the tax collection was generally lower than the tax capacity.

**Key Words:** Tax, Tax Capacity, Tax Effort, Public Expenses.

**Jel Codes:** H20, H21.

## TÜRKİYE'DE 1984-2012 YILLARI ARASINDA VERGİ KAPASİTESİ VE VERGİ GAYRETİNİN BELİRLEYİCİ ETKENLERİ

### Özet

Bir ülkenin kamu gelirleri içerisinde en büyük kalemi oluşturan vergi gelirlerinin sınırsız bir şekilde toplanacağını düşünemeyiz. Nitekim sınırsızmış gibi toplanmaya çalışılmasının tarihte ne tür toplumsal huzursuzluklara, krizlere yol açtığı malumdur. Bir ülkenin gelir düzeyinin vergilendirilir düzeyini belirlemek amacıyla kullanılan oranlardan bir tanesi olan vergi kapasitesi günümüzde genel kabul gören oranlardan bir tanesidir. Bu sınır ülkelere, zamana göre değişiklik gösterebilmektedir. Çalışmamızda vergi kapasitesinin hesaplanmasında kullanılan yöntemler literatür taraması ile belirlenerek, 1984-2012 yılları arasında Türkiye'nin vergi kapasitesi düzeyi ile gerçekleşen vergi yükü hesaplanmaya çalışılmıştır. Araştırmamızda vergi kapasitesinin ve vergi gayretinin hesaplanmasında bağımlı değişken olarak Vergi Gelirleri/GSYH, bağımsız değişken olarak Tarımın Katma Değeri (GSYH'nin %'si), Kişi Başına Gelir, Nüfus Artış Oranı, Dış Ticaret Yüzdesi, Yıllık GDP Büyüme Oranı (%) verileri, Yolsuzluk Endeksi ve Bürokrasinin Etkinliği kullanılmış, sonuç olarak vergi kapasitesini dış ticaretin olumlu yönde etkilediği ancak tarımın katma değeri değişkeninin ise olumsuz yönde etkilediği tespit edilmiştir.

Çalışmamızda 1984 yılından 2012 yılına kadar fiili vergi yükü ile vergi kapasitesi arasında genelde dengeli bir seyir göze çarpmakta olsa da genel itibariyle vergi kapasitesinin altında vergi tahsil edildiği görülmektedir.

**Anahtar Kelimeler:** Vergi, Vergi Kapasitesi, Vergi Gayreti, Kamu Harcamaları.

**Jel Sınıflandırması:** H20, H21.

<sup>1</sup> Research Asistant, Niğde Ömer Halisdemir University, Department of Public Finance, [eatsan@ohu.edu.tr](mailto:eatsan@ohu.edu.tr)

## INTRODUCTION

Governments have fundamental economic and social objectives they want to achieve. These objectives are economic development, effective distribution of sources, fair income distribution, and economic stability. For the general economy to reach the balance, governments make effort via public expenses and public revenues.

One of the most important reasons for the deterioration of economic balance is the public finance deficits. This can be clearly seen in this manuscript. The healthiest method for closing the public finance deficits is the taxes.

But there is a limit for increasing the taxes. When the increased taxes deteriorate the production, investment and saving balance of the society, then the balance for achieving the necessary economic and social objectives will also be deteriorated. This deviation from the balance creates the excess burden of taxes. While being used as a tool for achieving the fundamental economic and social objectives, the taxes shall not alter the basic economic macro balances.

### I. TAX BURDEN, TAX CAPACITY AND TAX EFFORT

The ratio of tax revenues to GDP, which has been used in order to measure the tax capacity and tax effort, is one of the most suitable methods that are used in monitoring the tax trends in literature (Le et al., 2012: 7). The tax burden or ratio can be simply defined as the portion of tax revenues within a period to the GDP of that time period. In addition to the definition including the taxes and funds collected by the central and local administrations, the tax burden can also be calculated by including the parafiscal revenues, namely the payments and premiums of social security institutions (Özyürek, 2000). Tax burden ratio (1) is an income-dependent variable; even if the proportional increases have been seen in recent years, the tax burden is at lower levels in low-income countries (Le et al., 2012: 4).

$$T/Y = f(T_p/Y, E) \quad (1)$$

Tax capacity ( $\hat{T}$ ) is the limit that is used in defining the maximum limit of the tax revenues that can be collected in a country within a certain time period. In other words, tax capacity (2) indicates the taxable economic potential in a country within a certain time period. Main factor determining the tax capacity is national income indicators, and it can also vary depending on the countries and development level (Öncel, 2001: 19).

$$\hat{T} = T_p/Y \quad (2)$$

Tax effort (E) defines the proportional relationship (3) between the estimated tax capacity of a country and the actual tax collection (Bahl, 1971: 582). The efficiency of tax authority, fiscal legislation and fiscal jurisdiction, attitudes of taxpayers towards the tax and the education level affect the tax effort (Akdoğan, 2002: 174).

$$E = (T/Y) / (T_p/Y) \quad (3)$$

Underdeveloped countries need capital for realizing their development projects. Besides the development efforts, also the factors such as changes in government's functions and in customer behaviors may also increase the need for public finance. But the public cannot be that efficient in increasing the revenues because of economic and politic reasons. Since the indirect taxes minimize the reactions of taxpayers towards the tax, the economic authorities see no harm in giving weight to indirect taxes (Ay and Talaşlı, 2008: 152). The economic and fiscal policies leading to the growth of government in Turkey have been implemented by the political authorities with the perspective of

unlimited authority. Especially the borrowing policy has become an alternative to the taxing, and the fiscal policy and tax burden concepts have not been sufficiently examined from the aspects of eliminating the social unfairness (Yereli, 2003: 112).

## II. TAX REVENUES/GDP IN YEARS 1984-2012

The ratio of the taxes, which the taxpayers are obliged to pay in a time period, to the income that they achieved is the personal tax burden. Despite there are many definitions of tax burden, total tax burden or tax ratio is calculated by subtracting the tax refunds from the total of tax collections in a country in 1 year and then dividing the result to the gross domestic product value of the same year. It can be stated that the portion of total tax burden within gross domestic product in Turkey has increased in course of time.

**Table 1. Tax Revenues /GDP Ratios for 1978 – 2012**

Years	Tax Revenues / GDP*	Years	Tax Revenues / GDP*	Years	Tax Revenues / GDP*
1978	11.7	1990	11.38	2002	17,58
1979	11.0	1991	11.86	2003	18,67
1980	11.1	1992	12.62	2004	18,32
1981	11.6	1993	12.77	2005	18,86
1982	9.9	1994	13.65	2006	18,60
1983	10.1	1995	12.72	2007	18,61
1984	7.75	1996	13.52	2008	18,16
1985	8.41	1997	14.83	2009	18,53
1986	10.20	1998	15.88	2010	19,20
1987	10.43	1999	16.52	2011	19,60
1988	10.16	2000	18.53	2012	19,70
1989	10.61	2001	19.31		

\* The taxes and funds collected by the local administrations are included but Social Security Institution payment is not. The tax refunds were subtracted from the tax revenues and the result was proportioned to the gross domestic product.

**Source:** The data regarding the period of 1978-2009 were obtained from DPT (State Planning Organization) and those regarding the period of 2010-2012 were obtained from the statistics of Revenue Administration.

Especially via the economic stability program dated 24<sup>th</sup> of January 1980, in order to ensure the structural changes for establishing the free market economy and ensuring the opening the economy for foreign trade, the interventionist approach of the period before 80s was left and the liberal state approach was adopted instead. Hence, in period before the year 1985, the decrease of share of budget in GDP reflected on the tax revenues and total tax burden decreased down to 7%. The use of public budget mechanism for allocating the resources in favor of capital led to the allocation of most part of tax revenues in period after 1990 to the interest expenditures. Thus, in period of 2001 crisis, the ratio of Interest Expenditures/Tax Revenues was 103.34% (Kargı and Özügür, 2007: 284).

The implementation of neo-liberal policies in globalization process, the problems experienced in decreasing the public expenditures, despite the withdrawal of government from the market and the incentives and tax deductions for capital sector, caused the chronic budget deficits. Closing this deficit via borrowing increased the debt burden and interest expenditures in course of time, and

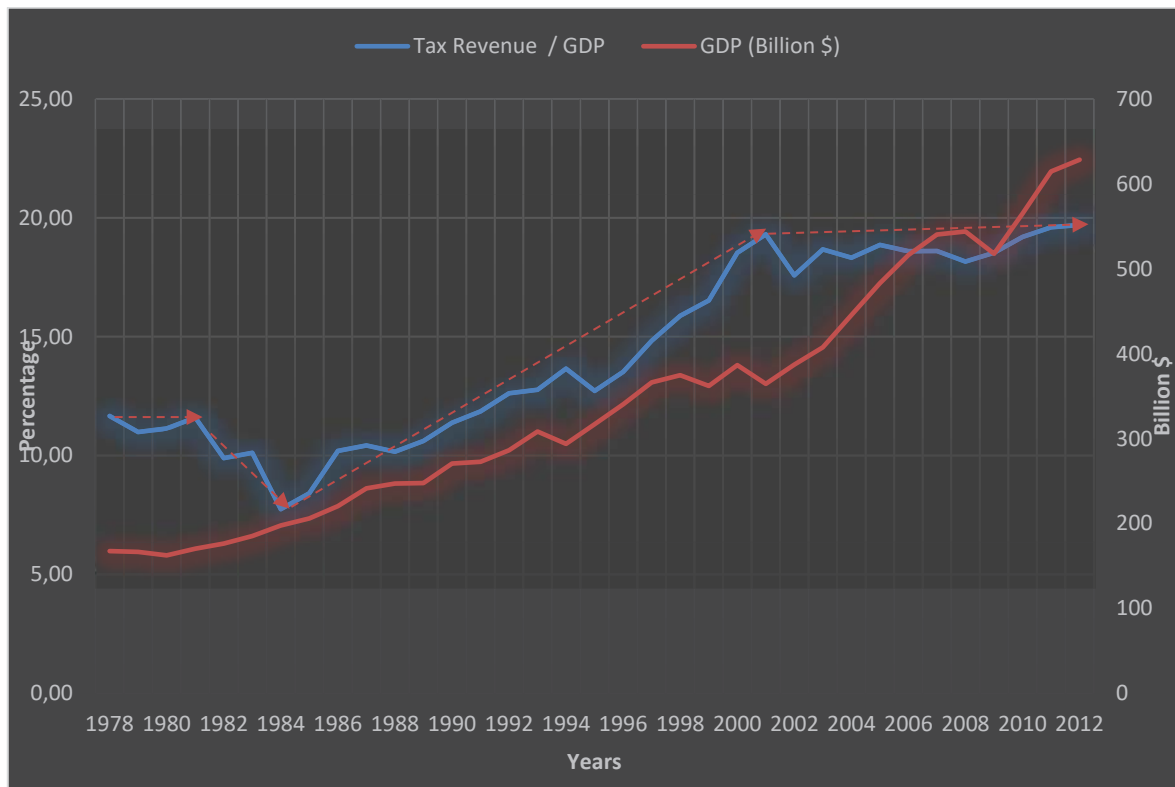
focusing on indirect taxes for funding this deficit led to more imbalanced structure in distribution of increased tax burden.

**Table 2. GDP for the period 1978 – 2012 (Million \$)**

Years	GDP (Million \$)	Years	GDP (Million \$)	Years	GDP (Million \$)
1978	167,609	1990	270,669	2002	387,025
1979	166,563	1991	272,619	2003	407,402
1980	162,486	1992	286,347	2004	445,547
1981	170,378	1993	308,256	2005	482,980
1982	176,449	1994	293,866	2006	516,274
1983	185,220	1995	317,018	2007	540,377
1984	197,652	1996	340,413	2008	543,937
1985	206,035	1997	366,208	2009	517,687
1986	220,483	1998	374,661	2010	565,092
1987	241,396	1999	362,052	2011	614,666
1988	246,999	2000	386,579	2012	628,429
1989	247,716	2001	364,554		

Source: World Bank (exchange rate of USD was fixed to the value in year 2005.)

**Graphic 1. Progression of Total Tax Burden between 1978 and 2012**



As seen in Graphic 1, the total tax burden indicated in blue coursed near 11% in year 1978, entered in decrease trend in post-1980 period and decreased down to 7.7% in year 1984, increased in period after the year 1984 as a necessity of budget balance, and reached at 19.7% in year 2012.

### III. STUDIES IN LITERATURE

Many studies have been carried out in foreign literature on measurement of tax capacity. Celliah, Baas and Kelly (1975), in their study carried out by taking the average of 47 countries, have measured the effects of many variables to find the portion of tax revenues in GDP. Among these parameters, they have determined the share of agriculture sector, that of mining industry and that of exportation to be the most suitable variables. Among these variables, while mining has affected the tax effort positively, the share of agriculture industry has affected negatively, and that of exportation has remained insignificant. While attempting the tax effort, they have used the variables of previous study of Chelliah (1971). Even if it has not been exactly proved, in general, it can be concluded from these studies that the tax effort is found to be high in countries with high share of tax revenue. Among the later studies, the study of Tait, Gratz and Eichengreen (1979), even though they couldn't achieve consistent results from the aspect of variables, they have determined higher tax effort in countries having tax burden higher than the average.

In his cross-sectional series analysis consisting of 83 developing countries for the period between 1978 and 1988, Tanzi (1992) has determined that the relationship between the per capita income level and tax effort was weak, and concluded that the macroeconomic variables were more important. Moreover, he has also found that agriculture sector was a very strong variable and also the borrowing ratio and the share of import were effective on the tax effort.

In study of Le, Dodson and Bayraktar (2012), they have selected approximately 110 developed and developing countries and dividing the period of 1994-2009 into sub-periods of 1994-2001 and 2002-2009, they have enlarged the study of Le, Moreno-Dodson and Rojchaichanthorn (2008) in terms of the data and the institutional quality (bureaucratic efficiency or corruption index) has been included in stud. While the effects of per capita income and foreign trade on tax effort are positive, the age sensitivity or population growth rate, the contribution of agriculture to GDP and the effect of institutional quality have been determined to be negative. But, when the institutional quality variables are added, then the variable of per capita income becomes statistically insignificant results. It can be said that per capita income loses its significance since the institutional quality variable covers the income effect. Also in population variable, it is seen to provide insignificant results in sub-periods (Le et al., 2012, 13). In this study, it is seen that 50% more data were added into the model than in study of Dodson and Bayraktar and Le et al. in year 2008, and 0.15-0.20 point higher scores have been achieved in terms of R-square value. The tax efforts of 110 countries have been calculated for the period of 1994 – 2009; Turkey's estimated tax capacity has been calculated to be 25.49, actual tax burden to be 18.98 and tax effort to be 0.74.

In Turkey, there are not so many studies on measuring the tax capacity. In study of Dursun (2008), covering a limited period, it has been determined that, while the portions of exports and imports in GDP in 15-year period between 1990 and 2006 have affected the tax capacity positively, the portion of manufacturing in GDP has affected negatively. It has also been determined for 15-year period that the actual tax burden has always remained lower than the estimated tax burden. In mentioned study, almost 94% of the change in tax revenue changes was explained with variables of "manufacturing, exports, and imports".

The existing studies, by performing generally the country comparisons, have not been limited to a single country, and mainly the developing countries, underdeveloped countries and developed countries have been analyzed separately or together. The existing model was implemented for all the countries by using mean values. Thus, at the end of implemented model, the systematic errors in independent variable calculations and consequently the ratios calculated for a country for a certain time period by comparing with other countries may be unclear; a variable that is positive for a country may be negative for another country. In Table 3, many of the previous studies are summarized.

Table 3. Empiric Summary of Previous Studies on Tax Effort

	Le, Dodson and Bayraktar (2012) Developed and Developing Countries	Bahl (2003) OECD and Underdeveloped Countries	Alm, Martinez-Vazquez and Schneider (2004) Developed and Developing Countries	Teera (2002) Developed and Developing Countries	Piancastelli (2001) Developed and Developing Countries	Stotsky and Wolde Mariam (1997) Sub-Saharan African Countries	Tanzi (1992) Developing Countries	Leuhold (1991) African Countries	Bahl (1971) Developing Countries	Shin (1969) Developed and Developing Countries	Lotz and Morss (1967) Developed and Developing Countries
<b>Dependent Variable</b>	Ratio of tax revenue to GDP and that of fiscal revenue to GDP	Ratio of tax revenue to GDP	Ratio of tax revenue to GDP	Ratio of tax revenue to GDP	Total tax revenue/GDP	Ratio of tax revenue to GDP	Ratio of tax revenue to GDP	Ratio of tax revenue to GDP	Tax capacity	Tax burden	Ratio of tax revenue to GNP
<b>Definitive Variables</b>	<p><b>Portion of agriculture in GDP</b> (negative, statistically significant)</p> <p><b>Portion of foreign trade</b> The ratio of the sum of exports and imports to the GDP (positive, statistically significant)</p> <p>Population growth rate (age sensitivity ratio) (negative, statistically insignificant in sub-periods)</p>	<p><b>Non-agricultural portion of GDP</b> (positive, statistically significant)</p>	<p>Agriculture/GNP (negative, statistically insignificant)</p> <p><b>Mining/ GNP</b> (positive, statistically significant)</p>	<p><b>Portion of agriculture in GDP</b> (negative or assumed to be positive, strongly negative effect in low-income countries.</p> <p>Portion of manufacturing sector in GDP (negative, statistically insignificant)</p>	<p><b>Agriculture/GDP</b> (negative and positive, negative and statistically significant in panel data analysis)</p> <p><b>Industry/ GDP</b> (positive, statistically significant in time series analysis)</p> <p>Portion of service sector in GDP (positive, not always statistically significant)</p>	<p><b>Portion of agriculture</b> (negative, statistically significant)</p> <p><b>Portion of mining</b> (negative, statistically significant)</p> <p>Portion of manufacturing (positive, negative, statistically insignificant)</p>	<p><b>Portion of agriculture in GDP</b> (negative, statistically significant)</p> <p><b>Mining/ GDP</b> (positive, negative, statistically insignificant)</p>	<p><b>Portion of agriculture</b> (negative, statistically significant)</p> <p><b>Portion of mining</b> (positive, statistically significant)</p>	GNP per capita (positive, statistically significant for samples and sub-samples of all high-income and low-income countries)	GNP per capita (positive, statistically significant for all the samples and the samples from low-income countries, but insignificant for high-income countries)	
	GNP per capita (positive, statistically insignificant with variable of	<b>Openness ratio</b> (ratio of the sum of imports and exports to GDP)	<b>GNP per capita</b> (negative, statistically significant)	GDP per capita (negative and positive, not always statistically significant)	GNP per capita (positive/negative trend:	<b>Income per capita</b> (positive, statistically significant)	Income per capita (positive, statistically significant, but statistically	<b>Ratio of foreign trade</b> (ratio of the sum of imports and exports to GDP) (positive,	Income per capita (positive, but statistically insignificant)	Foreign trade ratio (positive, statistically insignificant)	Ratio of the sum of imports and exports to GNP (%) (positive, statistically significant for



<i>institutional quality</i> )	<i>(positive, statistically significant)</i>			<i>positive, but not always significant)</i>		<i>insignificant for some years)</i>	statistically significant)			<i>all the samples and the samples from low-income countries, but insignificant for high-income countries)</i>
Management Quality (Bureaucratic efficiency and Corruption Index) (negative, statistically significant for sub-periods)	<b>Population growth rate</b> (positive, statistically significant)	Taxes on foreign trade /GNP (negative, statistically insignificant)	Ratio of the sum of imports and exports to GDP (negative and Positive, statistically insignificant, High positive effect in low- and mid-level income countries)	<b>Trade/ GDP</b> (positive, statistically significant)	Import/GDP (positive/negative, statistically insignificant)  Export/GDP (positive, statistically significant)	<b>Import/GDP</b> (positive, statistically significant)	<b>The ratio of foreign aids and debts to income</b> (positive, statistically significant)	Export rate (positive, but not always significant)	Ratio of agricultural income (negative, statistically insignificant)	
Underground Economy / GDP (negative, statistically insignificant when bureaucratic efficiency is added)	Simple correlation between tax effort and underground economy (negative, statistically insignificant)	<b>Underground economy / GDP</b> (negative, statistically significant)	Underground Economy (positive, but not always significant, negative and statistically significant only for OECD countries)			Ratio of foreign debts to GDP (Positive, but not always significant for all the assumptions)			Inflation rate (positive, statistically significant for only the low-income countries)	
<b>Total consumption / GDP</b> (positive, statistically significant)			Other determinants: Foreign aid rate (trend: Negative effect) Ratio of expenditures to GDP (trend: positive) Ratio of total expenditures (trend: Negative and positive)						Population growth rate (negative, statistically significant for all the samples and the samples from low-income countries)	

Source: Uptaded from the study of Bird, Vazquez and Torgler (2004).

#### IV. FACTORS DETERMINING THE TAX CAPACITY IN TURKEY BETWEEN 1984 AND 2012: MULTIPLE REGRESSION ANALYSIS

##### IV. I. Dataset Explanations

The data used in our analysis were obtained annually and cover the period between the years 1984 and 2012. As dependent variable, the tax revenues/GDP (% of GDP) values were obtained from State Planning Organization for the period of 1984 – 2009 and from Revenue Administration's website for the period of 2010 – 2012.

As the independent variables, the added-value of agriculture (% of GDP), income per capita, population growth rate, foreign trade percentage, annual GDP growth rate (%) data were obtained from databank of World Bank, and Corruption Index and Bureaucracy Efficiency were from website of Political Risk Services (2013)' (<http://www.prsgroup.com>).

##### ***Total Tax Burden (Ratio) (TAX/GDP):***

It is the dependent variable, calculated by subtracting tax refunds from total tax revenues (taxes and funds collected by local authorities included but Social Security Institution payment not included) and then dividing the result to gross domestic product.

##### ***Income per Capita (GDPpC):***

It is the GDP per capita. By keeping the USD rate in year 2005 constant, according to the purchasing power parity, it is re-indexed as the 10,000:1 of gross domestic product per capita. From the historical aspect, 2 factors played important role in tax burden comparisons between the countries; the development level, which is measured via the income per capita, and the size of foreign trade. Although higher levels of income per capita mean higher taxable income in tax effort approach, it is contradictive if the increased income would cause higher public service demand. But, the general acceptance is that the income per capita would increase the tax capacity but affect the tax effort only if it leads to increase in public expenditures (Bahl, 1971: 572).

##### ***Agriculture Sector Percentage (AGR):***

It indicates the percentage of agriculture sector in gross domestic product. In underdeveloped countries, the share of this sector is higher in proportion to those in developed countries. Taxing the agriculture sector is more difficult than other sectors due to both economic and politic reasons and it is possible for tax base to be affected negatively as the portion of agriculture sector within GDP (Leuthold, 1991; Tanzi, 1992; Piancastelli, 2001). For this reason, we estimate that the effect of agriculture sector's portion would be negative.

##### ***Population Growth Rate (POP (%)):***

It is a demographic variable and indicates the growth rate of population in years. According to Bahl, demographical characteristic of a country is one of the most important factors affecting the tax effort (Bahl, 2003: 13). The increase in population growth rate affects the tax collection capacity negatively. In other words, it has been determined that the effects in countries having high population growth rate are negative (Bird et al., 2004: 19, 20). For this reason, we estimate that higher population growth rate would affect the tax effort negatively.

##### ***Percentage of Freedom of Trade (TRADE):***

Trade openness rate, it indicates the amplitude of Trade openness rate or the percentage of the sum of exports and imports from the total of importation and exportation knowledge (4). According to many of the authors, foreign trade percentage is one of the important and the trade percentage is one of the most important determinants in taxing (Rodrik, 1998; Piancastelli, 2001; Norregaard and Khan, 2007; Aizenman and JinJarak, 2009, Le et al., 2012). Change in size of foreign trade has bilateral effects



in terms of tax revenues. If the taxes on foreign trade are removed or declined, they are supposed to affect the tax revenues negatively while, on the other hand, liberal economies would grow faster when the foreign trade increases, it will increase GDP and lead to enlarge the tax base (Le et al., 2012: 9).

$$\text{TRADE} = ((\text{EXP} + \text{IMP})) / \text{GDP} \tag{4}$$

Considering that the open economies have higher income than closed economies do, it is estimated that latter effect would be more significant than first one and, consequently, it would have positive effect on tax effort in our model.

**Governance Quality (GOVQ (CORR and BUREAU)) (-10 - -1):**

It is one of the institutional and governance indices measured in International Country Risk Guide (ICRG) prepared by PRS group (Politic Risk Services). According to this index, the countries are scored between 1 and 6 in corruption; 1 indicates the highest corruption level, while 6 indicates the lowest level.

The bureaucratic efficiency level is scored between 1 and 4; 1 indicates the lowest efficiency and 4 indicates the highest level. In our study, as Tanzi and Davoodi (1997) implemented and Le, Moreno-Dodson and Rojchaichaninthorn (2008) continued, in order to illustrate that the tax revenue would decrease as the corruption level increase, -1 indicates highest corruption and lowest bureaucratic efficiency levels, while -10 indicates the lowest corruption and highest bureaucratic efficiency levels.

$\alpha$  represents the constant value and  $\epsilon$  represents the error term.

**Table.3 Variables**

	TAX/GDP	GDPpC	POP	TRAD	AGR	BUREAU	CORR
1984	7.75	0.66	2.24	35.28	21.69	-5.00	-5.00
1985	8.41	0.68	2.14	34.83	20.26	-5.00	-5.00
1986	10.20	0.71	2.03	29.41	20.10	-5.00	-5.00
1987	10.43	0.76	1.94	33.34	18.47	-5.00	-5.00
1988	10.16	0.77	1.85	36.21	17.85	-5.00	-5.00
1989	10.61	0.76	1.79	33.98	17.10	-5.00	-3.47
1990	11.38	0.81	1.74	30.94	18.09	-5.00	-3.33
1991	11.86	0.80	1.68	30.48	15.80	-5.00	-4.03
1992	12.62	0.83	1.63	31.74	15.56	-7.50	-6.67
1993	12.77	0.88	1.60	33.02	16.07	-7.50	-6.67
1994	13.65	0.83	1.58	41.75	16.03	-7.50	-6.67
1995	12.72	0.88	1.57	44.24	16.29	-7.50	-6.11
1996	13.52	0.93	1.56	49.37	17.39	-7.50	-3.33
1997	14.83	0.98	1.55	54.97	14.97	-6.46	-3.33
1998	15.88	0.99	1.54	41.52	13.58	-5.00	-3.33
1999	16.52	0.94	1.51	38.73	11.54	-5.00	-3.33
2000	18.53	0.99	1.48	43.19	11.31	-5.00	-4.31
2001	19.31	0.92	1.45	50.76	9.95	-5.00	-4.72
2002	17.58	0.96	1.43	48.80	11.71	-5.00	-3.33
2003	18.67	1.00	1.40	47.03	11.39	-5.00	-3.89
2004	18.32	1.08	1.37	49.74	10.92	-5.00	-4.17
2005	18.86	1.15	1.33	47.21	10.80	-5.00	-4.17
2006	18.60	1.22	1.30	50.25	9.52	-5.00	-4.17
2007	18.61	1.26	1.26	49.81	8.68	-5.00	-4.17
2008	18.16	1.25	1.24	52.25	8.61	-5.00	-4.17

<b>2009</b>	18.53	1.18	1.24	47.74	9.35	-5.00	-4.17
<b>2010</b>	19.20	1.27	1.25	47.97	9.65	-5.00	-4.17
<b>2011</b>	19.60	1.36	1.27	56.39	9.14	-5.00	-4.17
<b>2012</b>	19.70	1.37	1.28	55.55	9.02	-5.00	-4.17

#### IV. II. Method

In solving and analyzing our multiple regression model, the “IBM SPSS Statistics 21” statistical package software was used.

Multiple regression analysis is a type analysis by estimating the dependent variable based on 2 or more independent variables related with each other. It allows interpreting the total variance explained in dependent variable by independent variables and making interpretations regarding the direction of relationship between independent variables and dependent variables. The mathematical model indicating the real linear relationship can be written as follows, for n independent variables;

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n + \varepsilon$$

where;

Y: Dependent variable

X: Independent variable

$\beta$ : Parameters to be estimated

$\varepsilon$ : Error term

In multiple regression analysis, the trends (b) indicate the amount of change in dependent variable in response to the unit change in independent variable, when other variables are kept constant, and they are named partial trend or parties regression coefficient (Köklü et al., 2007: 125).

*Hypothesis tests in multiple linear regression:*

In multiple regression model,  $H_0$  hypothesis is established in the way all the regression coefficients equal 0 (zero);

$$H_0 : \beta_1 = \beta_2 = \dots = \beta_p = 0$$

While,  $H_a$  is established in the way at least one  $\beta_i$  differs from 0. While t test is used for separate significance of each parameter, the significance of the model as a whole is tested with F test.

*t test:*

In this test, where the significance of estimated parameters in model are tested, it is determined if every independent variable has the power of explaining the dependent variable.

*F Test:*

In regression analysis, F test is used in order to test the significance of all the parameters, except for the constant parameter, as a whole. In this test, it is examined if all the independent variables as a whole have the power of explaining the dependent variable.

*Coefficient of Determination:*

Determination coefficient ( $R^2$ ) indicated the percentage of dependent variable explained by the independent variable.

**IV. III. Analysis**

In this section, the relation between the total tax burden and mentioned factors is discussed by using Multiple Linear Regression Model.

*Multiple Linear Regression Analysis*

The multiple linear regression model we used in our study is below:

$$TAX/GDP = f(GDPpC, AGR, POP, TRADE, GOVQ)$$

$$\left(\frac{TAX}{GDP}\right)_i = \alpha_i + \beta_1 GDPpC_i + \beta_2 AGR_i + \beta_3 POP_i + \beta_4 TRADE_i + \beta_5 GOVQ_i + \varepsilon$$

By using Durbin-Watson test, it was examined if there is an autocorrelation between the variables in model established in order to determine what the variables determining the tax capacity are. The Durbin-Watson test results between 1.5 and 2.5 indicate that there is no autocorrelation (Kalaycı, 2006: 267). Considering the tables below representing the model results for the period 1984 – 2012, it is seen that there is no autocorrelation because the Durbin-Watson test results are within the mentioned range. The information regarding the correlation coefficients between the variables used in model is presented in Tables 2, 3 and 4. In tables, it can be seen that the correlation coefficient values equal to or higher than 0.9 indicate that there is a multiple linearity problem with some variables. From this aspect, it is seen that there are multiple linearity problems in first 2 models. But in 3<sup>rd</sup> model, there is no multiple linearity problem.

The analysis results regarding every period are presented below.

**Table 4. Total Tax Burden Model Results (including Corruption Index)**

MODEL	R <sup>2</sup>	Corrected R <sup>2</sup>	Durbin-Watson	F	Significance Level
TAX/GDP	0.960	0.951	1.726	110.038	0
Model	Unstandardized Coefficients		Standardized Coefficients	t	Significance
TAX/GDP	β	Standard Error	β		
Constant	28.406	4.024		7.060	.000*
GDPpC	-2.370	2.101	-.128	-1.128	.271
POP	-2.413	1.898	-.173	-1.272	.216
TRAD	.080	.034	.176	2.346	.028**
AGR	-.745	.132	-.781	-5.625	.000*
CORR	.093	.172	.025	.543	.592

\* 1% significance level

\*\* 5% significance level

As understood from Table 4, the result (F = 110.038, Significance=0.000) of variance analysis testing the significance of a model as a whole indicates that the model is significant as a whole at every level. In Table 4, it can be seen that, as a result of regression analysis, the ratio of explanation of change in dependent variable by the independent variables (Corrected R<sup>2</sup>) is 95.1%. In our first model, where we aimed to measure the tax burden between the years 1984 and 2012, while the income per capita,

population growth rate, and agriculture sector have negative effect, foreign trade percentage and corruption index have positive effect. In addition to that, considering the statistically significance levels, it is seen that, while the level of foreign trade percentage was 5%, that of agriculture sector gas affected the tax capacity at the level of 1%. But, no statistically significant result could be achieved with income per capita, population growth rate, and corruption index variables.

**Table 5. Total Tax Burden Model Results (including Bureaucratic Efficiency)**

MODEL	R <sup>2</sup>	Corrected R <sup>2</sup>	Durbin-Watson	F	Significance Level
TAX/GDP	0.960	0.951	1.682	110.751	0
Model TAX/GDP	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	$\beta$	Standard Error	$\beta$		
Constant	29.857	4.973		6.004	.000*
GDPpC	-2.767	2.186	-.149	-1.266	.218
POP	-3.691	2.839	-.264	-1.300	.206
TRAD	.088	.034	.194	2.581	.017**
AGR	-.663	.191	-.695	-3.476	.002*
BUREAU	.177	.267	.045	.663	.514

\* 1% significance level

\*\* 5% significance level

In Table 5, it can be seen that the “Bureaucratic Efficiency” variable was added into the model but the same results with Table 4 were obtained. Even though the variance analysis testing the significance of model as a whole (F = 110,751, significance=0) seem significant, the correlation was found between the variables and it was determined that the variables other than the agriculture sector percentage and foreign trade percentage were statistically insignificant.

**Table 6. Total Tax Burden Model Results (including Agriculture Sector and Trade Liberalization)**

MODEL	R <sup>2</sup>	Corrected R <sup>2</sup>	Durbin-Watson	F	Significance Level
TAX/GDP	0.956	0.952	1.590	279.495	0
Model TAX/GDP	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	$\beta$	Standard Error	$\beta$		
Constant	23.002	2.002		11.488	.000*
TRAD	.075	.029	.165	2.544	.017**
AGR	-.807	.062	-.845	-13.062	.000*

\* 1% significance level

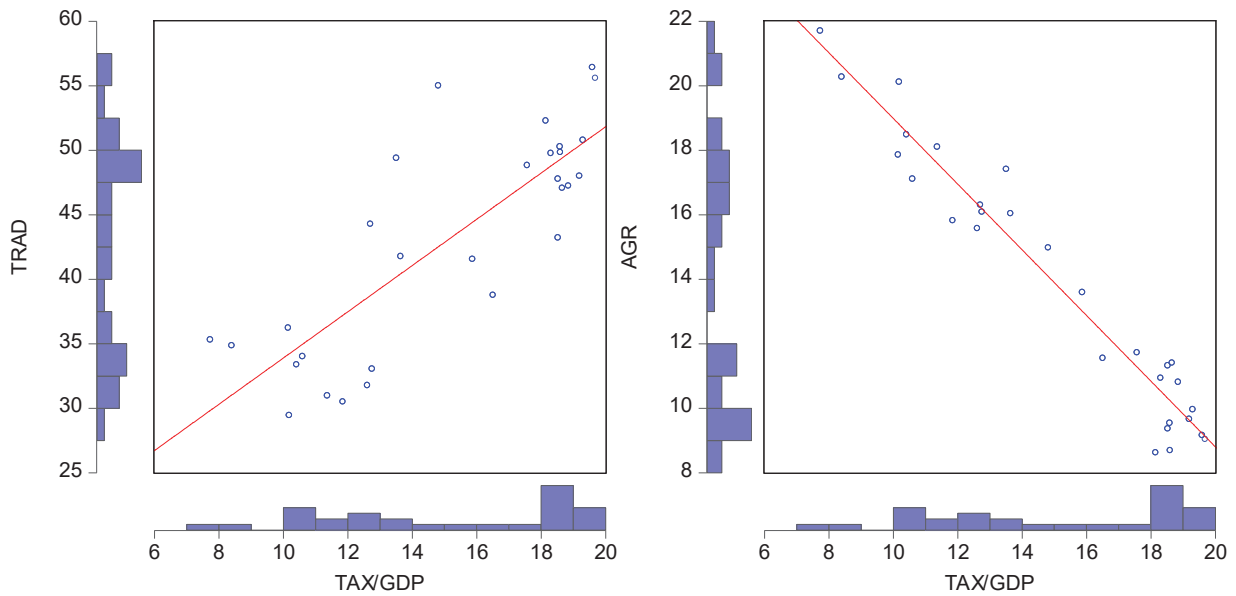
\*\* 5% significance level

Under the lights of results of Tables 4 and 5, the variables other than agriculture sector and foreign trade percentages were ignored and the model was re-established. When considered as a whole, the ratio of explanation of change in dependent variable by the independent variables (Corrected R<sup>2</sup>) was found to be 95.2%. It was observed that the foreign trade percentage affected the tax capacity at significance level of 5%, while agriculture sector did at significance level of 1% and there is no correlation problem between the variables.

The re-organized form of our model is presented below:

$$Y = 23.002 + 0.075 (\text{TRAD}) - 0.807 (\text{AGR})$$

**Graphic 2. Graphical illustration of regression between the dependent and independent variables**



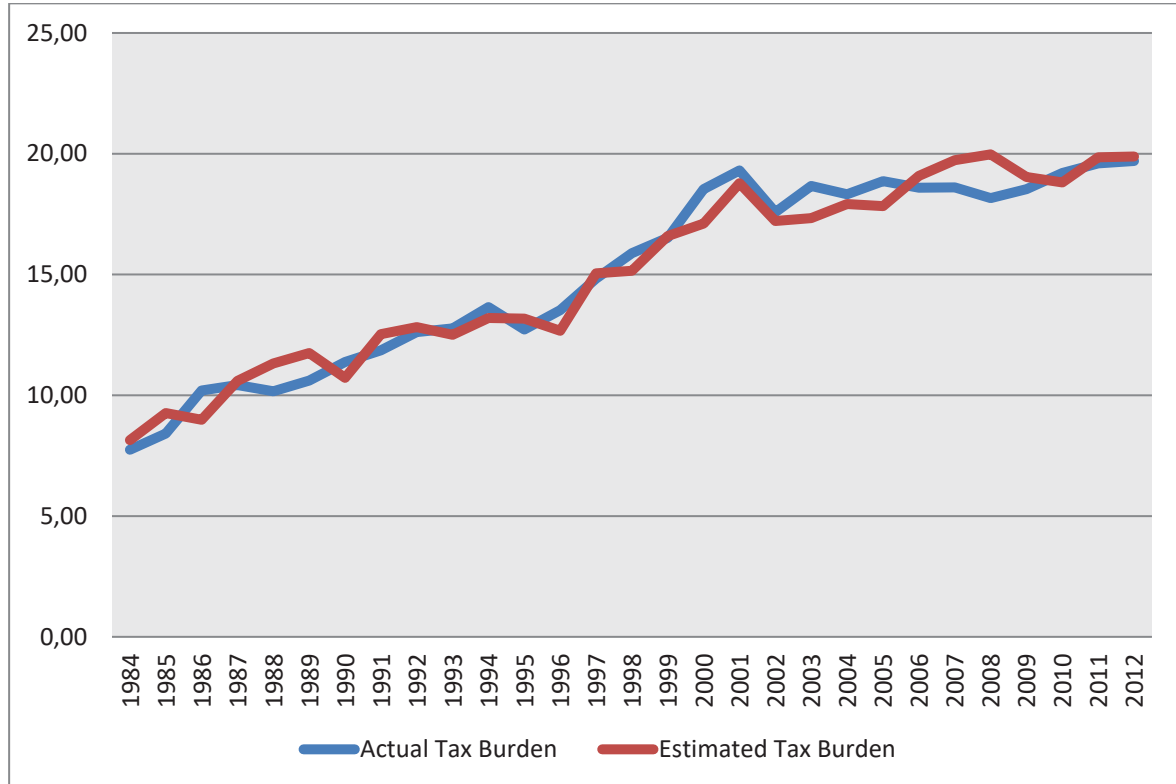
Accordingly, the actual tax burdens by the year and the levels of estimated tax burden (tax capacity) and tax effort levels are presented in Table 7.

**Table 7. Actual Tax Burden, Estimated Tax Burden, and Tax Effort**

Years	Actual Tax Burden	Estimated Tax Burden	Tax Effort	Years	Actual Tax Burden	Estimated Tax Burden	Tax Effort
1984	7.75	8.14	0.95	1999	16.52	16.60	1.00
1985	8.41	9.27	0.91	2000	18.53	17.11	1.08
1986	10.20	8.98	1.14	2001	19.31	18.78	1.03
1987	10.43	10.59	0.98	2002	17.58	17.21	1.02
1988	10.16	11.32	0.90	2003	18.67	17.34	1.08
1989	10.61	11.75	0.90	2004	18.32	17.92	1.02
1990	11.38	10.72	1.06	2005	18.86	17.83	1.06
1991	11.86	12.53	0.95	2006	18.60	19.08	0.97
1992	12.62	12.82	0.98	2007	18.61	19.74	0.94
1993	12.77	12.51	1.02	2008	18.16	19.97	0.91
1994	13.65	13.20	1.03	2009	18.53	19.04	0.97

<b>1995</b>	12.72	13.17	0.97	<b>2010</b>	19.20	18.81	1.02
<b>1996</b>	13.52	12.67	1.07	<b>2011</b>	19.60	19.85	0.99
<b>1997</b>	14.83	15.05	0.99	<b>2012</b>	19.70	19.89	0.99
<b>1998</b>	15.88	15.15	1.05				

**Graphic 3. Comparison of Actual Tax Burden and Estimated Tax Burden by years**



In our study, a generally balanced course is seen between the actual tax burden and tax capacity from 1984 to 2012, and the mean value of tax effort for these years was calculated to be 0.99. The year, when the estimated tax burden was higher than actual tax burden at most, is year 1988 (tax effort = 0.8982), and the year, when the actual tax burden was higher than estimated tax burden at most, is year 1986 (tax effort = 1.1350). In period between 1998 and 2005, the actual tax burden was calculated to be higher than estimated tax burden. But, in period between 2006 and 2010, the estimated tax burden was calculated to be higher than actual tax burden, and the difference reached at the highest point in year 2008 (1.81 points).

## RESULTS

In this study, we attempted to calculate the tax capacity and tax effort levels between the years 1984 and 2012 in Turkey. As dependent variable, Tax Revenues/GDP was used in our study in calculating the tax capacity and tax effort, and Added-Value of Agriculture (% of GDP), income per capita, Corruption Index, and Bureaucratic Efficiency, Population Growth Rate, Foreign Trade Percentage, and Annual GDP Growth Rate were used as independent variables; it was found that foreign trade affected the tax capacity positively, while the added-value of agriculture affected negatively. In Table 7, the actual tax burden, the estimated tax burden and the tax effort levels are presented. From the



aspect of years, it can be seen that, even though the actual tax burden followed closely, it coursed slightly lower than the estimated tax burden.

The level of tax effort in a country, which is lower or higher than 1, indicates the problems in tax policies of that country. While the taxed are used as a tool for funding the public deficits, they shall never lead to divert the main economic balances. Tax collection below the capacity indicates the problems in collection or supervision of taxes in that country. As seen in Graphic 3, the tax revenues are generally lower than the tax capacity in Turkey. But, it can also be seen that, in some years, the tax collections were very close to the tax capacity limit. In year 1993 and between 1999 and 2001, the tax burdens that were closest to the capacity were observed. The economic crises and fluctuations in country in those years have affected the tax policies. The high inflation rates in year 1994 and the precautions made under the name “April Regulations” aimed to increase the tax revenues. For this reason, the government has announced that tax audits would be made frequently and widely.

Moreover, various additional taxes have been placed in this period. The stability program of government, which was established in year 1999, lasted to the year 2001, and an increase was observed in tax collections by means of precautions taken and decisions made. With this program, the penalties and interest rates for tax delaying have been made compliant with inflation and it has been aimed to increase the tax collection. With law Nr. 4369 in July 1998, certain tax policies have been adopted and it has been aimed to prevent the reflections of potential crises on tax collections. Hence, even if the tight fiscal policies have been adopted in period after 1999, the monetary expansion has been kept limited. It has been seen that tax collection higher than the economic capacity has not been attempted, and it has been limited with the economic recovery.

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Annex Table 1. Variable Definitions and Sources

Variable	Definition	Source
<b>Tax Revenue/GDP (% of GDP)</b>	The ratio of all the revenues (except for the parafiscal revenues) to GDP (the tax refunds are subtracted).	DPT (1984-2009), GİB (2010-2012)
<b>Corruption Index</b>	Corruption assessment defines the politic system. This index is scored between 1 and 6. The countries having lower levels of corruption receive higher scores. Scores were re-calculated between P-10 and -1. The countries with lower scores have lower corruption levels, while those with higher scores have higher level of corruption.	ICRG (2013) <a href="http://www.transparency.org/">http://www.transparency.org/</a>
<b>Bureaucratic Efficiency</b>	Institutional strength and quality of the bureaucracy act as the buffer minimizing the policy changes when the governments change. The score varied between 1 and 4. The countries capable of sustaining the public services without any significant change or any interruption are scored with higher points. Scoring was re-calculated between -10 and -1. The country with lower score has more efficient bureaucracy, while that with higher score has more inefficient bureaucracy.	Political Risk Services (2013) <a href="http://www.prsgroup.com">http://www.prsgroup.com</a>
<b>Income per Capita</b>	Income per capita (GDP per capita (constant 2005 US\$))	WDI (2013)
<b>Population Growth Rate</b>	The rate of population of residents (migrants not included)	WDI (2013)
<b>Trade Liberalization</b>	Series: Trade (% of GDP) (NE.TRD.GNFS.ZS) The portion of sum of all the exported and imported goods and services to GDP.	WDI (2013)
<b>Added-Value of Agriculture (% of GDP)</b>	Series: Agriculture, value-added (% of GDP) (NV.AGR.TOTL.ZS). Agriculture and animal husbandry. The Added-value is the net output of that sector calculated by subtracting all the intermediate inputs from the overall outputs. It is calculated without subtracting the amortization of produced goods or the costs such as depletion and degradation of natural resources. Added-value is determined in accordance with the International Standard Industrial Classification (ISIC).	WDI (2013)
<b>Annual GDP Growth Rate (%)</b>	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2005 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.	WDI (2013)
<b>Underground Economy (%)</b>		Elgin, Öztunalı (2012) <a href="http://www.visaeurope.com">www.visaeurope.com</a> (2010- 2012)

**Annex Table 2. Correlation Coefficients of Variables In Model Regarding The Total Tax Burden (Including Corruption Index)**

		TAX	GDPpC	POP	TRAD	AGR	CORR
Pearson Correlation	TAX	1.000	.886	-.939	.815	-.972	.344
	GDPpC	.886	1.000	-.899	.820	-.904	.316
	POP	-.939	-.899	1.000	-.775	.944	-.275
	TRAD	.815	.820	-.775	1.000	-.769	.357
	AGR	-.972	-.904	.944	-.769	1.000	-.319
	CORR	.344	.316	-.275	.357	-.319	1.000
Sig. (1-tailed)	TAX	.	.000	.000	.000	.000	.034
	GDPpC	.000	.	.000	.000	.000	.047
	POP	.000	.000	.	.000	.000	.074
	TRAD	.000	.000	.000	.	.000	.029
	AGR	.000	.000	.000	.000	.	.046
	CORR	.034	.047	.074	.029	.046	.
N	TAX	29	29	29	29	29	29
	GDPpC	29	29	29	29	29	29
	POP	29	29	29	29	29	29
	TRAD	29	29	29	29	29	29
	AGR	29	29	29	29	29	29
	CORR	29	29	29	29	29	29

**Annex Table 3. Correlation Coefficients of Variables In Model Regarding The Total Tax Burden (Including Bureaucratic Efficiency)**

		TAX	GDPpC	POP	TRAD	AGR	BUREU
Pearson Correlation	TAX	1.000	.886	-.939	.815	-.972	.242
	GDPpC	.886	1.000	-.899	.820	-.904	.225
	POP	-.939	-.899	1.000	-.775	.944	-.044
	TRAD	.815	.820	-.775	1.000	-.769	.084
	AGR	-.972	-.904	.944	-.769	1.000	-.293
	BUREU	.242	.225	-.044	.084	-.293	1.000
Sig. (1-tailed)	TAX	.	.000	.000	.000	.000	.103
	GDPpC	.000	.	.000	.000	.000	.120
	POP	.000	.000	.	.000	.000	.411
	TRAD	.000	.000	.000	.	.000	.332
	AGR	.000	.000	.000	.000	.	.062
	BUREU	.103	.120	.411	.332	.062	.
N	TAX	29	29	29	29	29	29
	GDPpC	29	29	29	29	29	29
	POP	29	29	29	29	29	29
	TRAD	29	29	29	29	29	29
	AGR	29	29	29	29	29	29
	BUREU	29	29	29	29	29	29



**Annex Table 4. Correlation Coefficients of Variables In Model Regarding The Total Tax Burden (Including Agriculture Sector and Foreign Trade Percentage)**

		TAX	TRAD	AGR
Pearson Correlation	TAX	1.000	.815	-.972
	TRAD	.815	1.000	-.769
	AGR	-.972	-.769	1.000
Sig. (1-tailed)	TAX	.	.000	.000
	TRAD	.000	.	.000
	AGR	.000	.000	.
N	TAX	29	29	29
	TRAD	29	29	29
	AGR	29	29	29