Are There Any Correlations Between Fiscality Rate, GDP and Tax Incomes Flux? Case Study Romania and Turkey

By

Raluca DRĂCEA [1], Mirela CRISTEA [2], Costel IONAŞCU[3], Meltem İRTEŞ[4]

Abstract:

The academic literature analyzes the fiscality concern from all points of view, and the question which pressed upon the theoreticians and also the practitioners of the last decades remains: which is the adequate level of the fiscality? The difficulty in answering the question consists in opposite interests: on one hand, the government is willing to acquire the highest level due to the ascendant tendency of public expenses; on the other hand, the tax payers long for a much reduced level in order to dispose of more financial funds. Considering the theory of Arthur Laffer as well as the premise that the taxation structure (flat or progressive tax) is less important than the general level of taxation (tax burden), the purpose of this paper consists in the empirical analysis of the correlation between the tax pressure rate, GDP and the tax incomes flux within two States which adopt different tax systems: Romania and Turkey. For this purpose, we have described the methodology of creating the Laffer curve for Romania and Turkey and we have applied the methods concerning the analysis between the GDP and real tax systems, as well as those methods which estimate the empirical tendency of the fiscality rate within the two States, mentioned above, taking into account the parameters which determine it. The conclusion indicates the existence of a correlation between the real GDP and the real tax incomes, strongly

[1]*Assoc. Prof. PhD. Raluca DRĂCEA, A.I.Cuza Street, no. 13, postal code 200585, Craiova, Dolj, Romania, University of Craiova, Faculty of Economics and Business Administration, Finance Department, tel. +40.727.774.775, rdracea@rdslink.ro. Research interests include: fiscal policy, taxation policy/system, public finance, international finances*
[2]*Assoc. Prof. PhD. Mirela CRISTEA, A.I.Cuza Street, no. 13, postal code 200585, Craiova, Dolj, Romania, University of Craiova, Faculty of Economics and Business Administration, Finance Department, tel. +40.740.310.520, cmirela@yahoo.com. Research interests include: insurances and pension funds, banking administration and risk management.*
[3] *Assoc. Prof. PhD. Costel IONAŞCU, A.I.Cuza Street, no. 13, postal code 200585, Craiova, Dolj, Romania, University of Craiova, Faculty of Economics and Business Administration, Department of Economical Statistics, Analyze, Mathematics and Forecasting, tel. +40.744.562.569, Research interests include: statistics; business statistics, sampling, statistical inference; informatics*
[4] *Lecturer PhD. Meltem İRTEŞ, Cevatpaşa Mah. M. Akif Ersoy Cad. Nergis Apt. NO.ç3/1 Canakkale TURKEY postal code: 17100, Anadolu University, Open Education Faculty Canakkale Office, +90 286 213 02 61, mltmirtes@hotmail.com, Research interest: taxation policy, enforced collection, tax administration, tax law.*

manifested in Turkey (progressive tax system) as compared to Romania (flat tax system). Romania provides an optimistic position, based on standard tendencies which confirm the theory of Arthur Laffer within other countries in Eastern Europe.

Keywords: *Laffer curve, fiscality rate, tax incomes, statistical analysis, correlations*

JEL Classification: E62, H21.

1. Introduction

Using as source of the analysis the U.S. market economy saddled with mathematical arguments, the American economist Arthur B. Laffer (1978) pointed out, by means of a curve, *the relation between the tax pressure rate and the tax incomes flux*, recently known under the denomination of Laffer Law**.** This law became fast the theoretic groundwork and the reference support for the theoreticians of the offer economy. The Laffer curve is considered in almost every study referring to the fiscality level, due to its suggestive feature, and it reflects the relation between the tax pressure represented on the abscissa and the tax incomes on the ordinate (see Figure 1).

The representation of the tax pressure area for a certain country, on the Laffer curve, is difficult as long as the maximum threshold admitted theoretically has always been exceeded. As a rule, when a country is represented in the inadmissible area (*prohibitive range*) an increased tax base and the growth of tax incomes is expected, generated by the stimulative effect of all measures adopted for stimulating the output and the investment process (John F. Witte, 1985). The same effects are wanted for a country registered within the admissible area (*normal range*). It is possible that the expected effect do not manifest, when population claim new public utilities, and the funds alloted in this case are neither possible in a first stage, nor wanted, due to the rigidity of the work tender. In addition to this, a policy of tax extansion rejects the extension of the public economy to the exchange economy detriment, because of the negative effects on the global tender.

The practical issue of each government consists in the determination of the *adequate taxation rate* level*,* meant to register high tax incomes for the government (Government or local, regional authority). The adequate level is defined from the point of view of the institution entitled to decide the tax rate, the tax incomes maximization represent the objective function.

 Vauban[5] (1702) considers that the fiscality level of 10% should never be reached. Physiocrats have previously established a level of 20% of the individual incomes, and Proudhon (1868) stated it at 10% of the national income, and later on, Colin Clark (1970) increased it to 25%. Giscaud d'Estaing (1974) reached a

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[5] Richard Goodie – article published in "The Economist" magazine, August edition 1993, page 14

fiscality level of 40% of the GDP, for France, and in 1983 the level was 44%, in the mean time, this level has been exceeded in the northern countries.

Starting from the premise that the taxation method is less important (flat or progressive tax) than the general level of taxation (tax burden), the purpose of this paper consists in the empirical analysis of the correlations between the tax pressure rate, GDP and the tax incomes flux within two States which adopt different tax systems: Romania and Turkey. After the presentation of theoretical basis, the paper has the following structure: section 2 treats the performance methodology of the Laffer curve for Romania and Turkey, the correlation between the GDP and real tax incomes and methods of estimating the empirical tendency of the tax rate within the two States according to the characteristic parameters; section 3 consists of an analysis of all data acquired considering the described methodology; finally, the paper ends with conclusions and recommendations.

2. Theoretical Basis

Studying the relation between the tax pressure and tax incomes, A. Laffer together with V.A. Canto şi D.H. Joines (1978) in their paper "Taxation, GNP and Potential GNP"[6], reached the conclusion that the growth of the tax pressure does not necessarily determine the adequate accumulation of tax incomes, in exchange, *the diminution of the tax pressure generates favourable conditions for the growth of tax incomes*. This conclusion was based on a mathematical argument according to which the capital and the work are rewarded considering the marginal income:

$$P = K^{\alpha} x M^{1-\alpha}$$

(1)

where: $0 < \alpha < 1$;

α and $1-\alpha$ = elasticity of factors K and M;

P = output value;

K = capital factor;

M = work factor.

The analysis pattern introduces a series of simple hypothesis, this why they are considered as the *the weak point of the theoretical basis* (Samuelson and Northaus, 1992):

- the compensation rates of the capital factor (R_V) and work factor (W_V) are achieved taking into account their marginal value and they are expressed according to the output value (P):

$$R_V = \frac{\partial P}{\partial K} \text{ and } W_V = \frac{\partial P}{\partial M}$$

(2)

- the net reward of the capital factor (R) and work factor (W) differs from the gross reward ($R_{V \text{ and }} W_V$) due to the taxation rates (t_K and t_W) applied to the incomes of the factors:

$$R_V = R(1 + t_K) \text{ and } W_V = W(1 + t_W)$$

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[6] Human Rights Report – electronic information base includes statistics concerning different economic and statistic indicators, http://www.cato.org/pubs/journal/cj1n1/cj1n1-1.pdf

(3)
- the functions of the capital and work tender are:

$$K_0 = \left(\frac{R}{W}\right)^a xR^e, \qquad a < 0, e < 0$$

(4)

$$M_0 = \left(\frac{W}{R}\right)^b xW^e, \qquad b < 0, e > 0 \, sia + e > 0; b + e > 0$$

(5)

The expressed hypothesis lead to the following preliminary conclusions:

- for a certain output level, any change interfering between the rates (R_V and W_V) of gross reward of the factors changes the demand of capital and work factors in the case of enterprises;

- any change of the net rewards (R and W) of the factors changes the market tender within the administration department, by substituting a factor in a certain proportion with another one.

The elementary character of these hyothesis regarding the rate elasticity of tax drawings and the curve analysis, considered as a reflection of the tax history specific to a country and and the last stage in the evolution of the tax system, determined the French economist Henri Sempe (1981) to propose the study of a fragment of their evolution, in order to prevent the risk of obtaining an exchange economy and the disappearance of the State.

A series of American authors contradict the legitimacy of the Laffer curve (McConnell and Brue, 1990; Dornbusch and Fischer, 1990) as well as the effects generated by the diminution of the tax rate at the American economy level, the critics engendered fervent reactions from the supporters part (Clark, Dwight, 1996). Other critics regarding the Laffer curve (Mirowski, 1982; Denicolo, 1988) are related to its empirical character, the lack of relevant variables and controversies concerning the underground economy.

Subsequently, in a recent article[7], Arthur Laffer (2005) illustrates the expected effects giving concrete examples which confirm his theory. There have been three major periods of tax-rate cut in the U.S. history: the Harding-Coolidge cuts of the mid-1920s; the Kennedy cuts in the 1960s and the Reagan cuts in the 1980s. The most recent examples belong to the ex-socialist States, where unique tax-rates are experimented for the first time[8].

The displaced Laffer curve (Hoanță, 1997) describes all the elements in a different way (figure no.1).

The minimum tax rate I_{min} corresponds to a minimum budget meant to provide a reduced bureaucracy, and efficiency for the government's improved

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[7] Arthur B. LAFFER, The Laffer Curve: Past, Present, and Future, Policy Research & Analysis, June 1, 2004, The Heritage Foundation.

[8] In 1994, Estonia introduces a unique tax rate of 26%, generating an annual average economic growth of 5,2%. Subsequently, the unique tax rate has been reduced to 20%. Other countries of the Central and Eastern Europe adopted unique tax rates: Latvia 25% - in 1997, Russia 13% - in 2000, Slovakia 19% - in 2004 and Ukraine 13%, Romania 16% - in 2005.

fiscal situation. The adequate tax rate I_0 places the drawing of the largest amount of incomes resulting from taxes, retained by the government. All possible rate between I_{min} and I_0 represent tax rates which are available for the government – business entity in a market economy.

The maximum tax rate I_{max} indicates the tax rate which satisfies the following relation:

$$I_{max} = V - \sum \frac{VPD}{V} \cdot 100$$

(6)

where V is the income achieved by the population of a country, during one year, and VPD represents the individual income established by the public authority which becomes totalitarian.

So, if for the interval I_{min} and I_0 the activity of collecting incomes is functional and equitable, reaching the maximum value in point M, for the interval I_0 and I_{max} it is not the same situation, the collected incomes retained by the government tend to a sudden increase, which is not the result of the taxation effect, but of the seizure performed within imposed working conditions stripped of freedom of initiative.

Considering the relation between the tax incomes level and the gross domestic product, we may notice that (Văcărel, 2005) a highly developed country from the economic point of view posses numerous possibilities for the reallocation of public financial resources (resulting from taxes, duties and contributions) in order to satisfy the general needs of the society.

Presently, a number of governments (we mention here Romania and Turkey) posses a reduced GDP per inhabitant compared to that registered by the European Community countries, and the GDP reallocation percentage through taxes and duties are superior to those registered by highly industrialized countries. The explanation for this situation consists in the reduced level of GDP registered within those countries and in the existence of numerous unsolved economic and social issues (for a reduced GDP, the necessary resources results from the growth of the tax rate).

An important research ellaborated by the specialists of the Economic and Social Council of France (Le Clezio, 2005) pointed out the way in which the public budget proportion of 18 developed countries of the world influences the economic growth, the GDP level/inhabitant and the poverty rate of those countries. The study entitled "Prélèvements obligatoires: compréhension, efficacité économique et justice sociale" clearly substantiates the fact that there is no coordination, between the value of taxes and duties reported to the GDP value and the economic growth. Countries as Norway, Finland, Denmark or Sweden, with public budgets which represent more than 50% of the GDP, registered the last decade an economic growth more important than in Japan (with a public budget of 29% of the GDP). Moreover, Norway registered the highest rhythm of economic growth among the most developed States, with a public budget of over 55% of the GDP (here the taxes and duties paid by Norwegians are very high).

The French specialists tried to establish a correlation between the public budget income level and the GDP/inhabitant, but they didn't succeded in achieving such a correlation. Norway and U.S.A. are highly developped countries (over 35,000 dollars/inhabitant), even if the tax rate in Norway registers the highest value, and in U.S.A., its value is among the smallest. In exchange, one may notice the existence of a very thight correlation between the public budget importance and the limitation of the inequality level, or the return of poverty in the case of children. If programs of social support were not enforced, financed from taxes and duties, the poverty rates among children would be very close in Sweden and U.S.A., of 23.4%, respectively 26.7%. In reality, as a result of the enforcement of social support measures, these rates represent 2.6% in Sweden and 22.4% in the U.S.A.

3. Material and Method

Considering that the taxation method is less important (flat or progressive tax) than the general level of taxation (tax burden), the purpose of this paper consists in the empirical analysis of the correlations between the tax pressure rate, GDP and the tax incomes flux of Romania and Turkey and the analysis of the tax rate tendency according to the characteristic parameters.

Necessary data used for the representation of the Laffer curve (table 1 and table 2) are provided by the National Institute of Statistics and the Ministry of Economy and Finance for Romania (INSSE) and by the State Institute of Statistics Turkey (DIE). The influence of the tax rate over the total amount of collected tax incomes[9] at general public budget level is registered for the following time interval 1991-2006.

In order to obtain the values corresponding to the GDP and to the tax incomes, the inflation impact has not been considered. The values assigned to the parameters have been transformed into comparable values by reducing them to the same basis of comparison (year 1991) and for achieving international comparisons, all data have been calculated using the same currency (euro). The studied period, 1991-2006 for Romania and Turkey, registered important currency exchange fluctuations as well as measures concerned with the national currency denomination. In order to reduce the effects generated by these situations, the values of the two variables have been changed in euro using the average currency exchange registered during the last year of the interval - 2006.

For the analysis of the causes which have led to the tax rate fluctuation registered in Romania and Turkey, there have been used the statistic analysis of the correlations established between different variables which influence the tax level.

The correlation between the real GDP and the real tax incomes has been tested for each country by means of the special software SPSS. Several patterns have beeen employed for the determination of the regression pattern, the best

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[9] Total amount of collected tax incomes includes direct, indirect taxes and social security contributions.

result proved to be the parabolical pattern.

According to the tendencies registered by the indicators during the studied period (1991-2006), a graphical representation was made, for each country, estimating these indicators during the period 2007-2009 (the dotted blacklines existing in the graphic representation).

In order to achieve a comparison between the analyzed parameters specific to each country, all differences resulting from the number of the population specific to each country were eliminated. The real GDP values/inhabitant and the real tax incomes/inhabitant were used for the comparison.

4. Results and Discussions

According to A. Laffer's theory, taking into account the evolution of tax incomes and rates, one may identify two areas:

- the „admissible" area (*normal range*), where the increase (diminution) of the tax pressure is followed by the corresponding increase (diminution) of the tax incomes to the State general consolidated budget;

-    the „inadmissible" area (*prohibitive range*), where the increase of the tax pressure is followed by the diminution of tax incomes.

In Romania (figure 2), existed, during the analyzed interval, *11 periods of „admissibility",* respectively, the years 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2004, 2005 and 2006. During the intervals mentioned above, *the increase of the tax pressure was followed by the increase of tax incomes to the budget* in 6 years (1995, 1998, 1999, 2004, 2005 and 2006), for the rest of the interval (1993, 1994, 1996, 1997 and 2000) the diminution of the tax pressure led to the corresponding diminution of tax incomes.

In the year 1992, the increase of 0.1 percentage points registered by the tax rate determined a diminution of 1.7 million euros of the tax incomes (or, the increase of the tax pressure admitted under the circumstances of the tax incomes diminution generates a more important diminution of the GDP). For the years 2001, 2002 and 2003, though the diminution of the tax pressure determined or corresponded to an increase of tax incomes, they remain in the inadmissible area representation of the Laffer curve, due to the fact that the tax pressure level, whose diminution determines the increase of tax incomes, is superior to that adequate tax pressure which provides the maximum value of tax incomes, meaning that it can be reduced until it reaches the optimum level (or, the diminution of the tax pressure admitted under the circumstances of the tax incomes growth is rather the result of a higher increase of the denominator, represented by the gross domestic product, in the case of the tax rates diminution for the main taxes).

Although, the affirmation according to which the tax pressure diminution is followed by the tax incomes diminution, situation placed in the admissible area representation on the curve, and the tax pressure diminution is followed by the tax incomes increase, situation placed in the inadmissible area representation, seems a little bit illogical, the estimation should be done according to Laffer's theory, *reported to the optimum level of the tax pressure* which provides the maximum

amount of incomes, thus, for the first situation the tax pressure level is placed below the optimum level, and for the second situation, above the optimum level.

Turkey (figure 3) was represented in the *prohibitive range* only during two years of the analyzed interval of 16 years (1995 and 2001), for the rest of the period, the tax rate increase was followed by the tax incomes increase.

In Romania, the real *gross domestic product* (figure 4) indicates a parabolic type tendency. The minimum values are registered in the year 1992 (an important rise in prices was registered in this year) and the year 1999 (as a result of the period of massive restriction of the State enterprise activity and of a private sector inadequately developped, unable to attenuate this effect).

The second half of this interval (1999-2006) clearly indicates a stabilization tendency based on increasing values.

The *real tax incomes* (figure 5) register a parabolic type tendency indicating a minimum value in 1997 and important fluctuations during 1994-2000 (generated by frequent changes of the tax level). The last part of the analyzed period (2000-2006) points out a continuous increase of the value of this variable.

The *tax rate* (figure 6) presents an evolution registering important fluctuations, with an absolute minimum in 1997 caused by a minimum level of real tax incomes during the same year and an absolute maximum in 1999 (generated, this time, by the combination: local maximum for tax incomes and local minimum for the GDP).

A study of the *correlation between the real GDP and tax incomes* (figure 7) reveals the fact that there exists a strong correlation between these two, illustrated by a direct non-linear graphical representation. The tests performed confirm the fact that this correlation is very significant (table 3). In order to determine the regression pattern, several other patterns were tested, the best proved to be the parabolical pattern (tables 4-6).

$$\text{Real GDP} = 121{,}602 - 8{,}409 \cdot \text{Real tax incomes} + 0.284 \cdot \text{Real tax incomes}^2$$

As a conclusion, the real GDP value depends directly and in a great extent on the real tax incomes value. Thus, the increase of its values is generated by the increase of the real tax incomes to the limit consented by the tax payers.

For Turkey, the fluctuations of the *gross domestic product* (figure 8) registered each year are less important, indicating a non-linear increasing tendency of a polynomial 3rd order type. This tendency is the result of a more coherent economic policy compared to Romania. The transition to a new currency by denomination generates the diminution of the real GDP in Turkey, while in Romania, this situation was absent.

The real tax incomes (figure 9) registers an almost linear, continuous increasing tendency reaching values 6 times more important at the end of the period, compared to the beginning of the same period.

The tax rate (figure 10) also presents an increasing tendency of parabolical form, indicating an accelerated increase during the last three years of the studied period.

In Turkey, the tax system also registers a *strong correlation between the real GDP and the real tax incomes* (figure 11), which is stronger than that registered in Romania. The correlation report value, R, is 0.953 for Turkey and

0.867 for Romania (tables 7-10). One may notice a direct correlation of polynomial 3rd order type:

$$\text{Real GDP} = 54{,}477 + 7{,}848 \cdot \text{Real tax incomes} - 0{,}037 \cdot \text{VReal tax incomes}^2 +$$
$$+\, 0{,}0000478 \cdot \text{Real tax incomes}^3$$

According to the tests, this correlation is very significant.

In order to compare the two States it was necessary to eliminate the differences generated by the number of the population specific to each country. The real GDP values/inhabitant and the real tax incomes/inhabitant were used for the comparison.

Surprisingly, the proportion *real GDP level/inhabitant in Turkey (candidate country for the EU) is at least twice more important than compared to Romania for almost the entire period considered for the comparison* (figure 12). The proportion real GDP/inhabitant, for both countries, indicates an increasing tendency with greater fluctuations in the case of Turkey.

The real tax incomes in Turkey (figure 13) register higher values than compared to Romania, during the period 1993-2006. In 1991, the real tax incomes reached higher values in Romania, and in 1992, the values corresponding to each country were very close. Starting with the year 1993, differences between the real tax incomes values are more important. The variation of tax incomes is more important in Turkey than in Romania.

Regarding the tax rate (tax burden), except the year 1991, it is higher in Turkey than in Romania and it indicates a continuous increasing tendency (figure 14).

5. Conclusions

The analysis performed demonstrates that reaching the fiscal optimum is an illusion. The results of the analysis in the two states with different fiscal systems reflect that the real problem does not refer to taxation modality, progressive or proportional, but to general level of taxation correlated with the effects to social aspects.

In *Romania,* the enforcement of the unique tax rate of 16% (2005) led, on average term, to the *evidence of the economic effect suggested by Laffer*: the growth of tax incomes. This growth is determined by three causes: (i) the emergence of a part of the dark economy; (ii) the increase of the private consumption due to high salaries, which led to the increase of VAT incomes; (iii) the increase of the investments made by companies.

The reaction manifested by the Romanian economy to the tax policies was in accordance with the economic laws based on economic theories. Presently, Romania adopts an optimistic attitude, based on the statistic tendencies which confirm Arthur Laffer's theory, applied by other countries in the Eastern Europe.

Though, the form of the Laffer curve, in the case of Romania, is not identical to that introduced by the American economist, this fact evidenced that the *tax pressure can not be considered as a variable of the economic conduct or as an economic indicator*, for the given period.

On the other hand, the reduced tax level in Romania (under the circumstances that the tax rates for the main taxes are similar to those adopted by other countries in the Eastern Europe), points out *a reduced collection of taxes* mainly due to the tax payment evasion phenomenon. In Turkey, the tax rate indicates an ascending tendency, constituting one of the factors which generates the imbalance of the living standard (the purchasing power is reduced), registering thus a low value of the real GDP per inhabitant.

The continuous diminution of the tax level in Romania, after the year 2000, considering the increase, in real terms of the gross domestic product and, respectively, the diminution of the tax rates for the main taxes, may be explained as it follows: (i) the increase of the tax base is insufficient in order to compensate the loss of incomes generated by the diminution of the tax rates; (ii) the diminution of the tax pursuance level and the spread of the tax dodger phenomenon.

In Romania, the real GDP value depends depends in a great extent on the real tax incomes value. Thus, the increase of its values is generated by the increase of the real tax incomes to the limit consented by the tax payers.

In Turkey, the tax system also registers a strong correlation between the real GDP and the real tax incomes which is stronger than that registered in Romania (the correlation report value is 0.953 for Turkey and 0.867 for Romania), fact that demonstrates that *in Turkey, due to the reduced GDP, the largest part of the resources necessary for the public sector finance is obtained by increasing the tax rate* (it registered a continuous increasing tendency). Surprisingly, the proportion real GDP level/inhabitant in Turkey (candidate country for the EU) is at least twice more important than compared to Romania for the great part of the given period (the proportion nominal GDP/inhabitant in Romania is superior to that registered in Turkey for the entire studied period). This situation proves that *there is not a direct co-ordination between the level of tax incomes received at public budget and GDP/inhabitant.* Romania registers a fiscality rate which is situated with almost 10% under the Turkey one and a real GDP/inhabitant two times smaller.

Direct relation of dependency between GDP and real fiscal incomes (in both studied countries) brings up to the following conclusion: the stimulation, through the State involving, of GDP growing will inevitably leads, through *redistribution process*, an economic development with positive implications to autochthonous capital, too. In the actual stage of the two studied economies, the growing of real GDP can achieve only to the foreign investments way. Thus, for Turkey it is necessary a reduction of the fiscality level in the same time with growing of base taxation, and for Romania a better collection, administration and, especially, distribution of fiscal incomes received to the public budget.

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Table 1.Real GDP, real tax incomes and tax rate evolution during the period 1991-2006 (Romania)

Year	Nominal tax incomes*) (mil. lei)	Nominal GDP (mil. lei)	GDP deflation indicator	Real GDP (mil lei)	Real tax incomes (mil lei)	Real GDP (1991=100%) (mil. lei)	Real tax incomes 1991=100% (mil. lei)	Real GDP **) 1991=100% (mil. eur)	Real tax incomes**) 1991=100 (mil. eur)	Tax rate (%)
1991	73.3	220.3	2.951	74.65	24.84	220.30	73.30	62.51	20.80	33.27
1992	201.2	603.0	3	201.00	67.07	201.00	67.07	57.03	19.03	33.37
1993	626.6	2003.6	3.274	611.97	191.39	203.99	63.80	57.88	18.10	31.27
1994	1404.2	4977.3	2.391	2.081.68	587.29	211.94	59.79	60.13	16.96	28.21
1995	2080.3	7213.5	1.353	5.331.49	1.537.55	227.02	65.47	64.41	18.58	28.84
1996	2924.8	10892.0	1.453	7.496.21	2.012.94	235.92	63.35	66.94	17.97	26.85
1997	6701.4	25292.5	2.473	10.227.46	2.709.83	221.53	58.69	62.85	16.65	26.50
1998	10541.6	37379.9	1.552	24.084.99	6.792.27	210.95	59.49	59.85	16.88	28.20
1999	18493.7	54573.0	1.478	36.923.55	12.512.65	208.37	70.61	59.12	20.04	33.89
2000	23748.7	80377.3	1.443	55.701.52	16.457.87	212.68	62.84	60.34	17.83	29.55
2001	33145.5	116768.7	1.374	84.984.50	24.123.36	224.87	63.83	63.80	18.11	28.39
2002	41739	151475.9	1.234	122.751.94	33.824.15	236.40	65.14	67.07	18.48	27.55
2003	53564.9	197564.8	1.194	165.464.66	44.861.73	258.23	70.01	73.27	19.86	27.11
2004	67623.6	246371.6	1.158	212.756.13	58.396.89	278.08	76.33	78.90	21.66	27.45
2005	79032.3	287186.3	1.114	257.797.40	70.944.61	290.98	80.08	82.56	22.72	27.52
2006	96847.1	342198.4	1.082	316.264.70	89.507.9	320.44	90.69	90.92	25.73	28.30

*) this category includes taxes, duties social security contribution
**) Reported to the exchange currency eur/lei registered in 2006
Source: Processed data based on National Institute of Statistics, Romania

Table 2. Real GDP, real tax incomes and tax rate evolution during the period 1991-2006 (Turkey)

Year	Total Turkish Tax Incomes (mil. YTL)	GDP (mil. YTL)	Deflator GDP	Real GDP (mil YTL)	Real Total Turkish Tax Incomes (mil YTL)	Real GDP 1991=100% (mil YTL)	Real Total Turkish Tax Incomes 1991=100% (mil YTL)	Real GDP *) 1991=100% (mil eur)	Real Total Turkish Tax Incomes *) 1991=100% (mil eur)	Tax rate (%)
1991	78.6	630.1	1.63835	384.60	48.00	384.60	48.00	212.33	26.50	12.48
1992	141.6	1,093.4	1.65143	662.07	85.75	662.07	85.75	365.51	47.34	12.95
1993	264.3	1,981.9	1.68386	1,176.98	156.94	712.70	95.04	393.46	52.47	13.33
1994	587.8	3,868.6	2.05421	1,883.23	286.12	677.23	102.89	373.87	56.80	15.19
1995	1,084.4	7,762.5	1.84227	4,213.53	588.59	737.62	103.04	407.21	56.88	13.97
1996	2,244.1	14,345.4	1.68934	8,491.74	1,328.39	806.92	126.23	445.47	69.69	15.64
1997	4,745.5	28,720.6	1.86436	15,405.12	2,545.37	866.53	143.18	478.38	79.04	16.52
1998	9,228.6	53,523.0	1.80768	29,608.68	5,105.22	893.32	154.03	493.17	85.03	17.24
1999	14,802.3	82,925.5	1.63125	50,835.66	9,074.21	848.47	151.45	468.41	83.61	17.85

Year										
2000	26,503.7	127,844.3	1.43129	89,321.00	18,517.34	913.91	189.46	504.53	104.60	20.73
2001	39,735.9	188,141.3	1.59088	118,262.72	24,977.39	845.41	178.55	466.72	98.57	21.12
2002	59,631.9	278,220.6	1.3708	202,961.74	43,501.40	912.01	195.47	503.49	107.91	21.43
2003	84,316.2	359,762.9	1.21793	295,389.89	69,229.32	968.29	226.93	534.56	125.28	23.44
2004	101,038.9	430,511.5	1.10128	390,917.70	91,746.44	1,052.14	246.93	580.85	136.32	23.47
2005	131,948.8	487,202.4	1.08000	451,113.28	122,174.79	1,102.49	298.59	608.64	164.84	27.08
2006	151,271.7	416,071.9	1.06238	391,640.33	142,389.08	886.24	322.21	489.26	177.88	36.36

*) **) Reported to the exchange currency Eur/YTL registered in 2006
Source: State Institute of Statistics Turkey
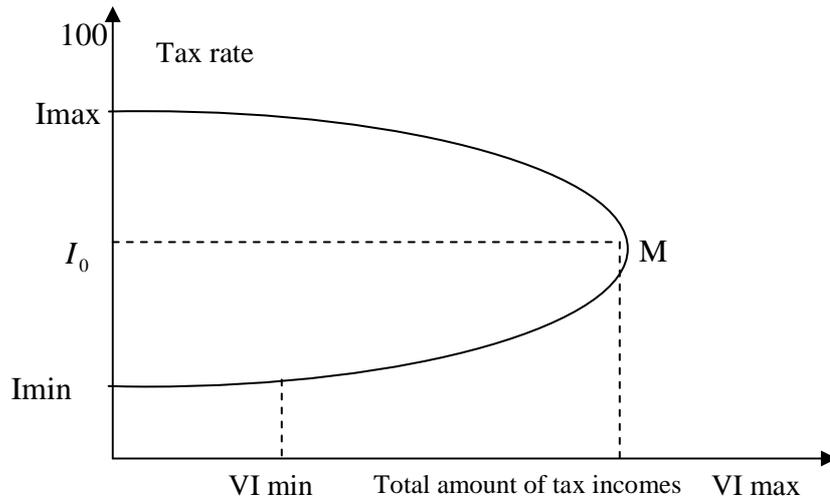
Figure 1. Displaced Laffer curve
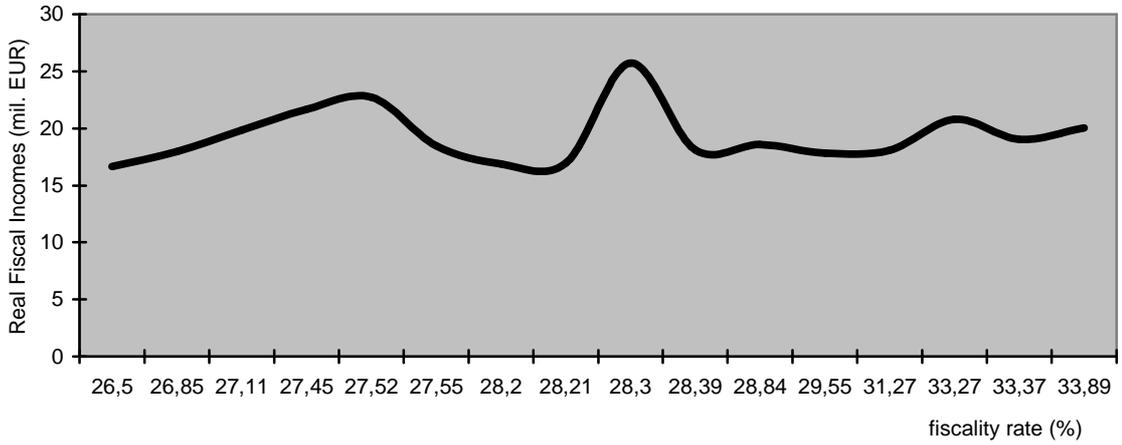
Figure 2. Laffer curve (Romania)
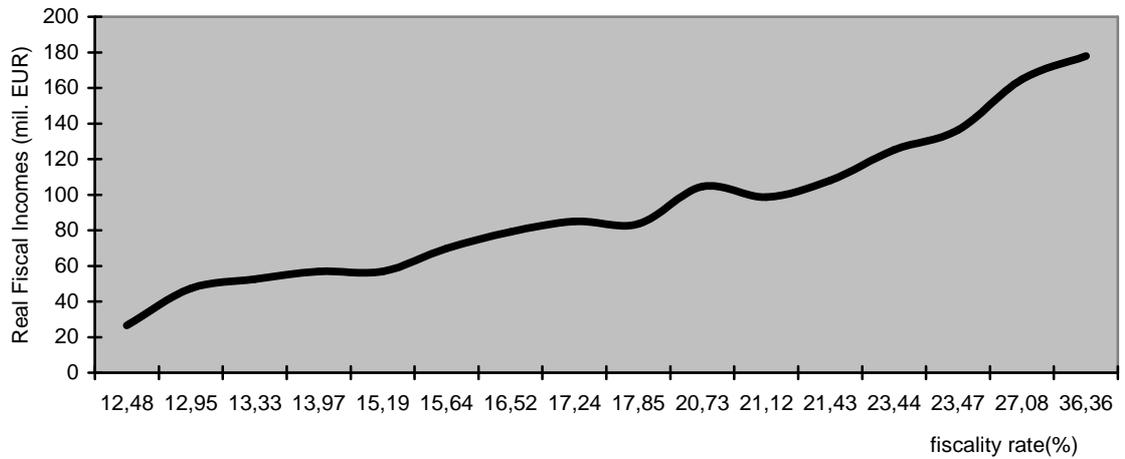
Figure 3. Laffer curve (Turkey)
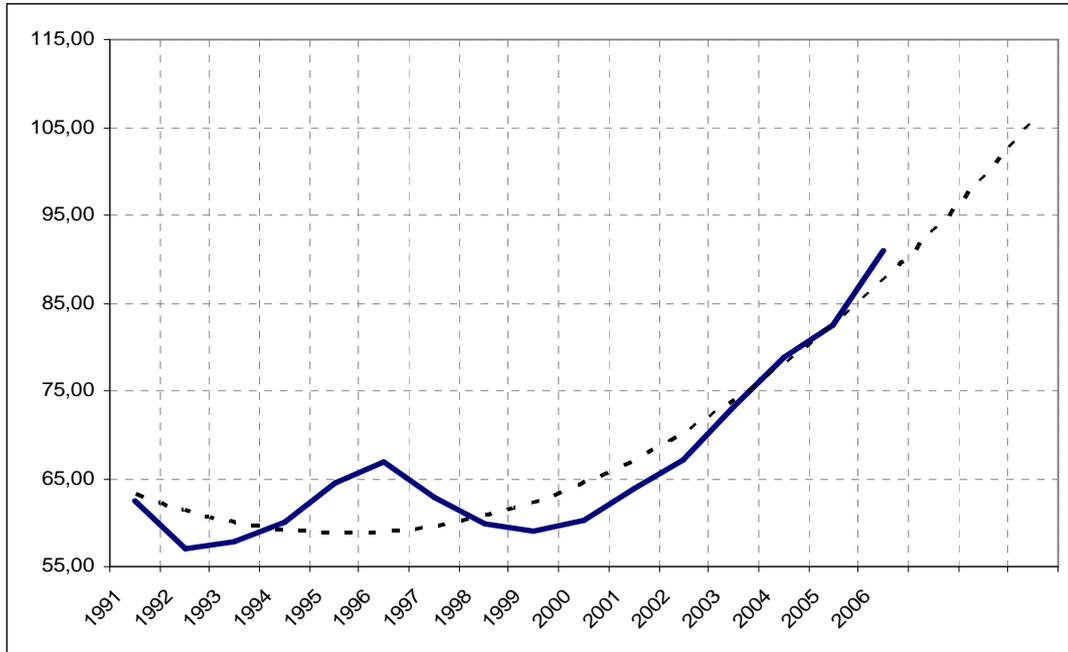
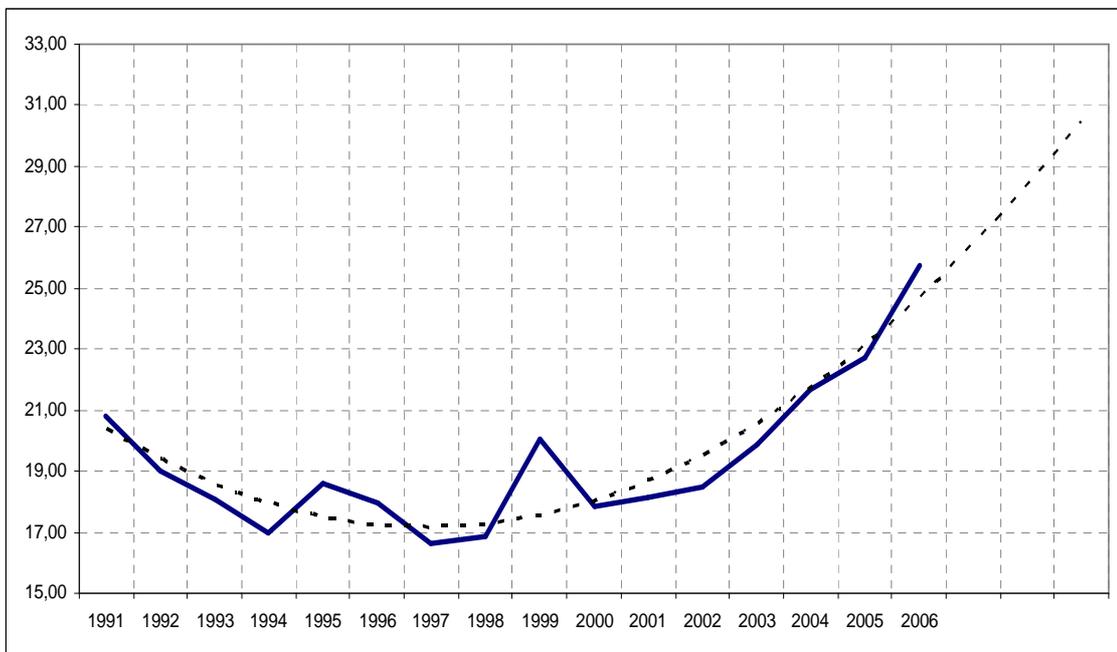**Figure 4. Real GDP in Romania 1991=100% (million euros)**

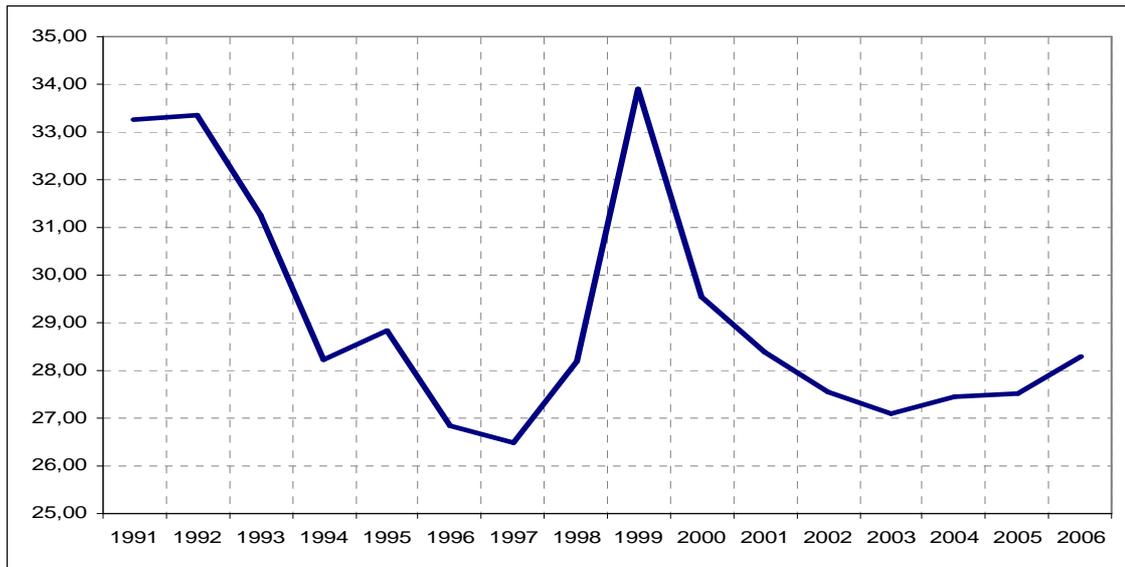**Figure 5. Real tax incomes in Romania 1991=100 (million euros)**

Figure 6. Tax rate in Romania (%)

Table 3. Correlation Real GDP and Real Tax Incomes, Romania

		Real GDP	Real tax incomes
Real GDP	Pearson Correlation	1	,843(**)
	Sig. (2-tailed)		,000
	N	16	16
Real tax incomes	Pearson Correlation	,843(**)	1
	Sig. (2-tailed)	,000	
	N	16	16

** Correlation is significant at the 0.01 level (2-tailed).

Quadratic

Table 4.Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,867	,751	,713	5,241

The independent variable is Real tax incomes.

Table 5.ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1078,539	2	539,270	19,630	,000
Residual	357,127	13	27,471		
Total	1435,666	15			

The independent variable is Real tax incomes.

Table 6.Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta	B	Std. Error
Real tax incomes	-8,409	8,081	-2,083	-1,041	,317
Real tax incomes ** 2	,284	,194	2,933	1,465	,167
(Constant)	121,602	83,072		1,464	,167

PIB_real_1991_eur
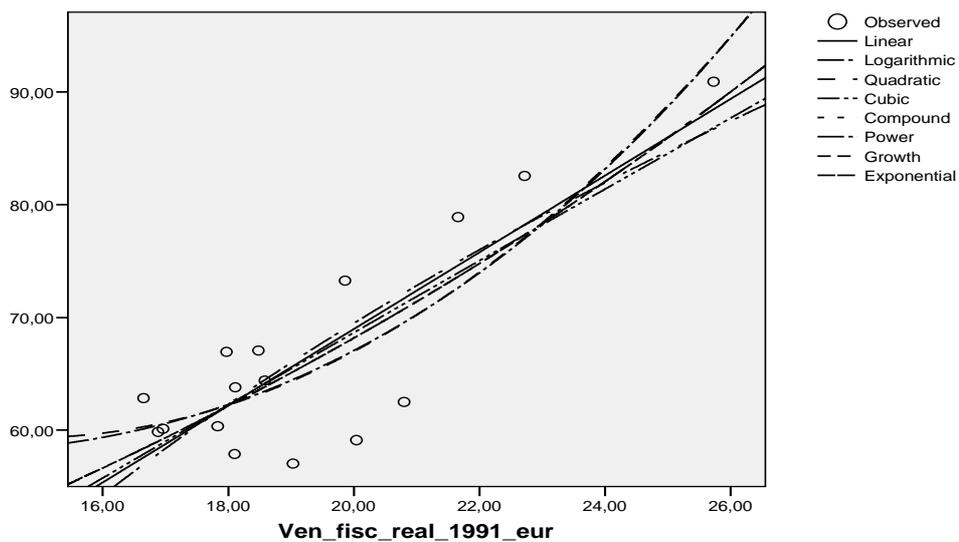
Figure 7. Correlogramme real GDP – Real tax incomes for the period 1991-2006, Romania
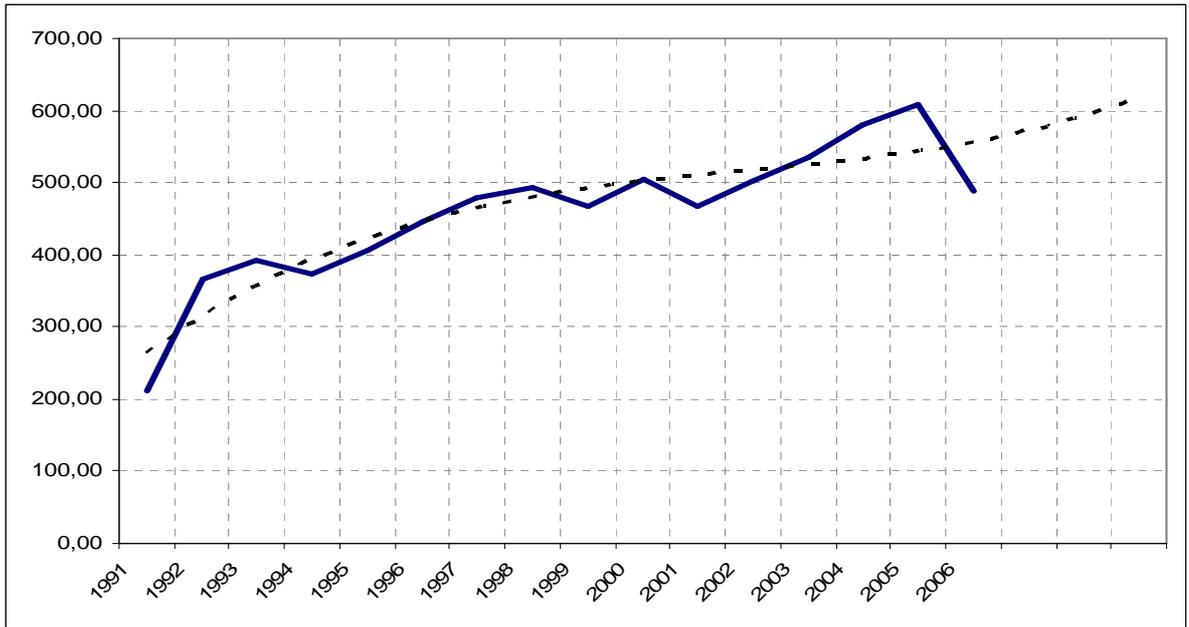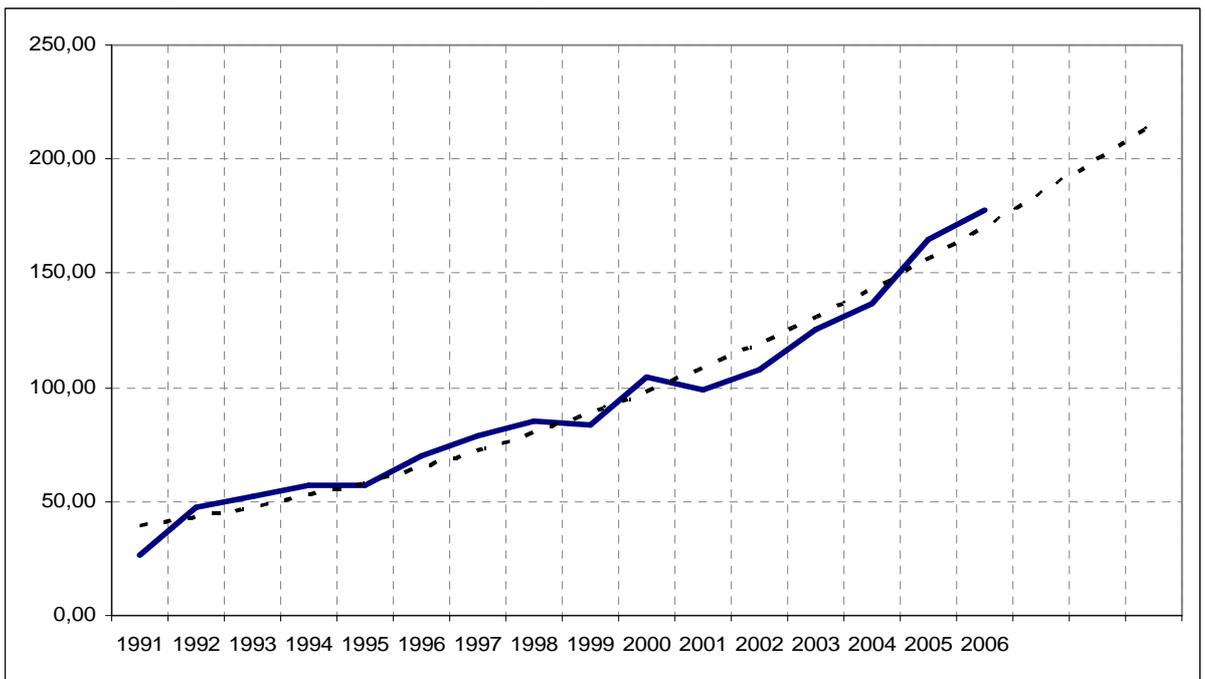
Figure 8. Real GDP in Turkey 1991=100% (million euro)

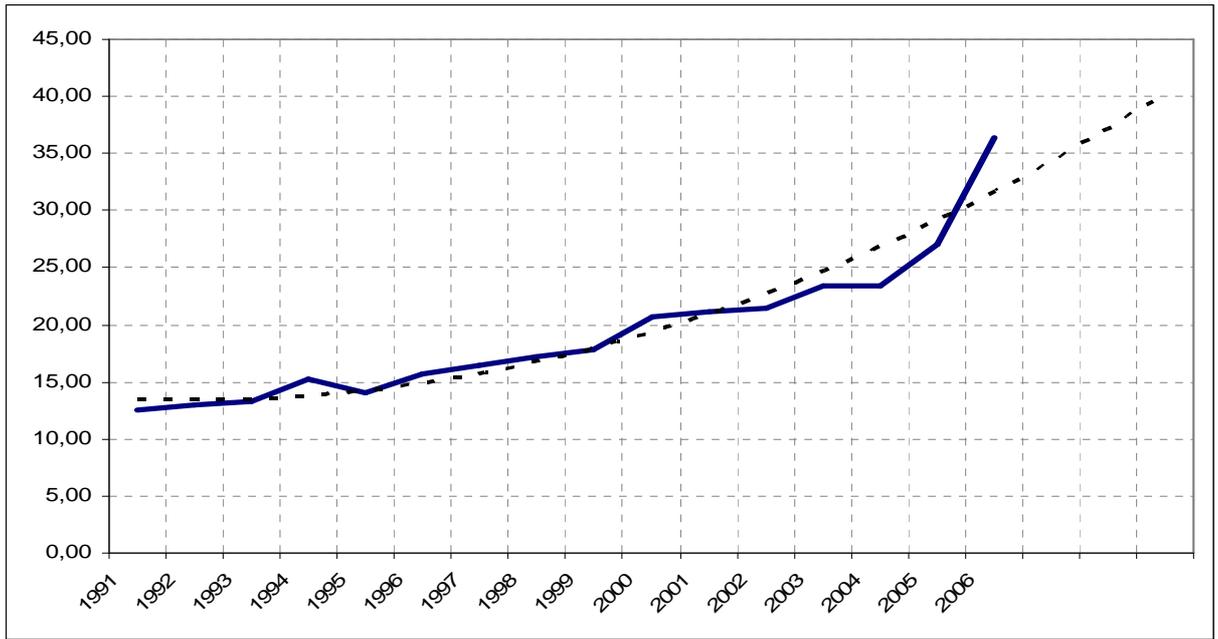**Figure 9. Real Total Tax Incomes in Turkey 1991=100% (million euro)**

Figure 10. Tax rate in Turkey (%)

Table 7. Correlation Real GDP and Real Tax Incomes, Turkey

		Real GDP	Real tax incomes
Real GDP	Pearson Correlation	1	,831(**)
	Sig. (2-tailed)		,000
	N	16	16
Real tax incomes	Pearson Correlation	,831(**)	1
	Sig. (2-tailed)	,000	
	N	16	16

** Correlation is significant at the 0.01 level (2-tailed).

Cubic

Table 8. Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,953	,907	,884	32,119

The independent variable is Real tax incomes.

Table 9. ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	121202,680	3	40400,893	39,163	,000
Residual	12379,291	12	1031,608		
Total	133581,970	15			

The independent variable is Real tax incomes.

Table 10. Coefficients

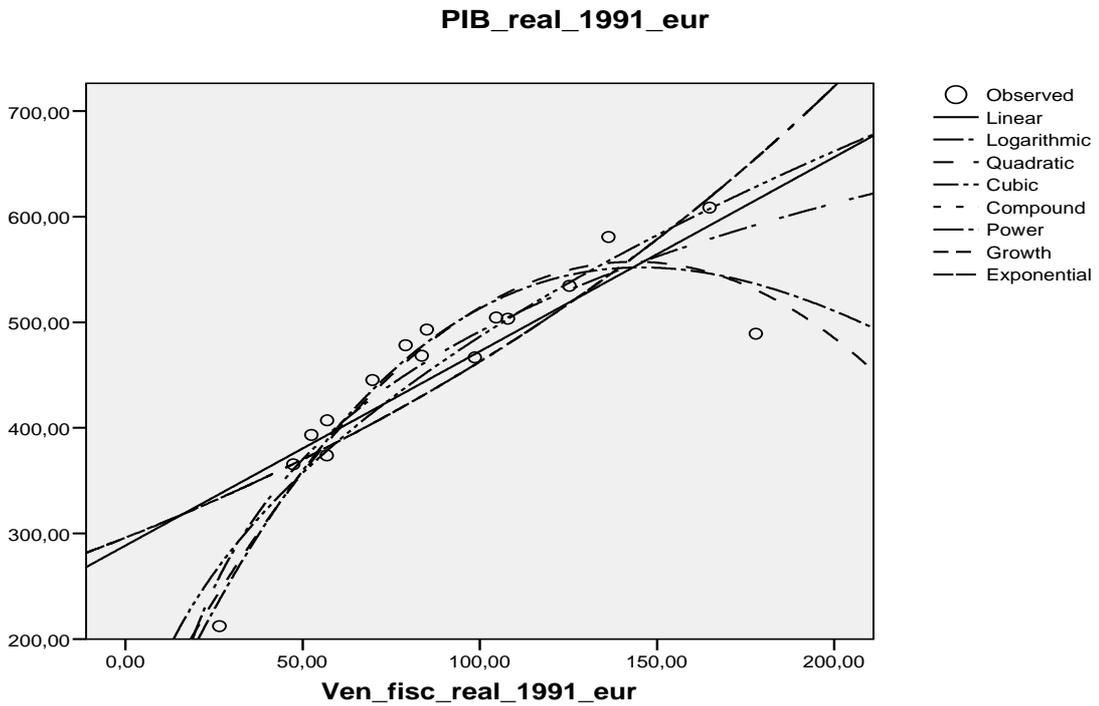|	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta	B	Std. Error
Real tax incomes	7,848	3,102	3,549	2,530	,026
Real tax incomes ** 2	-,037	,033	-3,575	-1,119	,285
Real tax incomes ** 3	4,78E-005	,000	,832	,442	,666
(Constant)	54,477	86,480		,630	,541

PIB_real_1991_eur

Figure 11 Correlogramme real GDP – Real tax incomes for the period 1991-
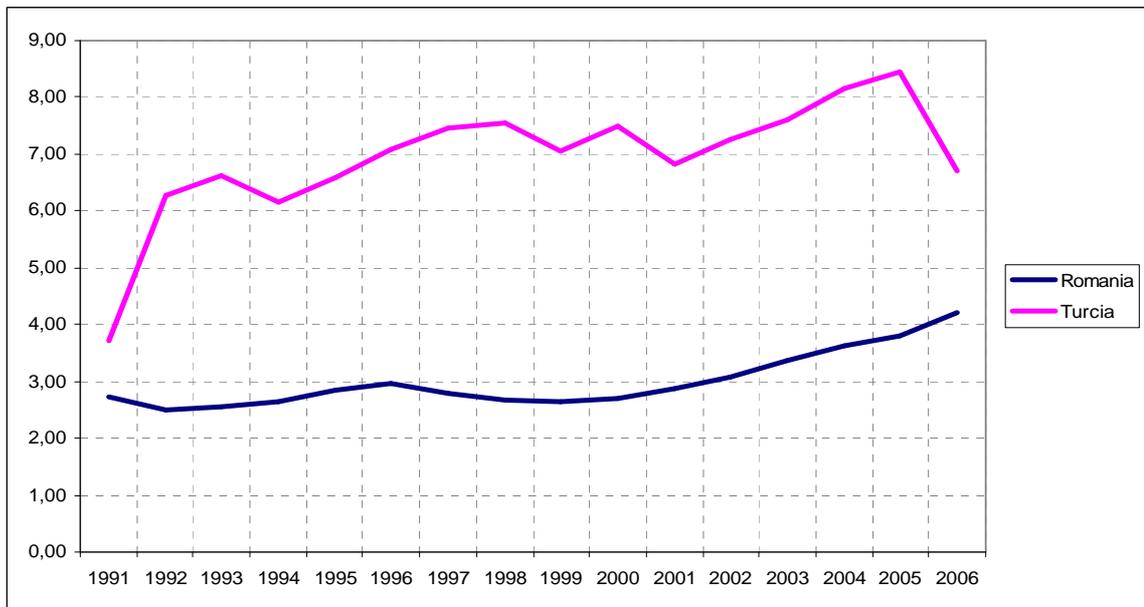
2006, Turkey

**Figure 12. Real GDP/inhabitant 1991=100% (euro/inhabitant), Romania and
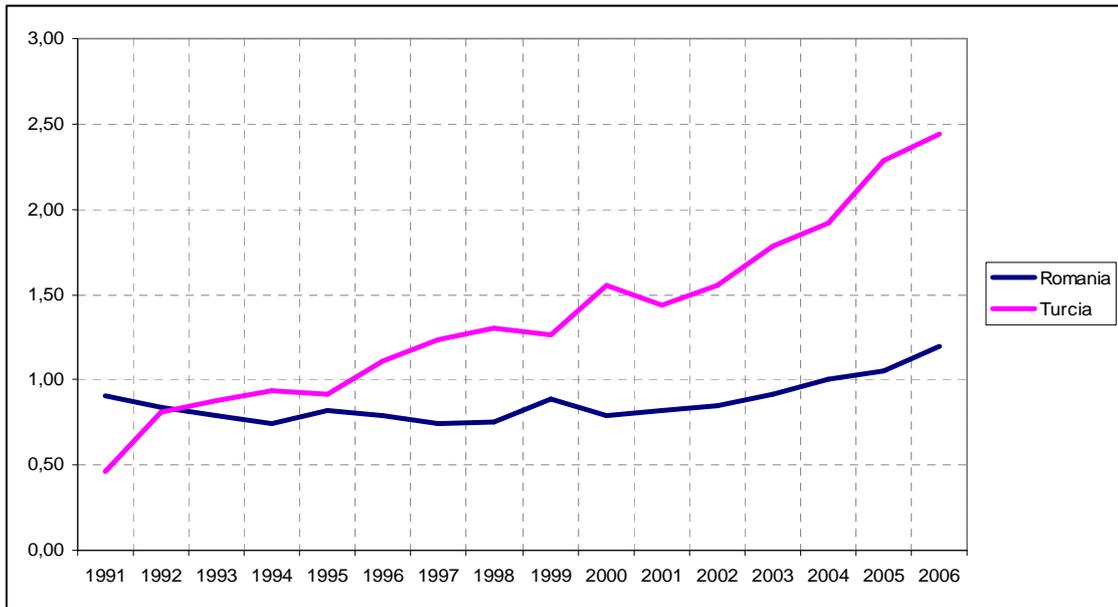Turkey**

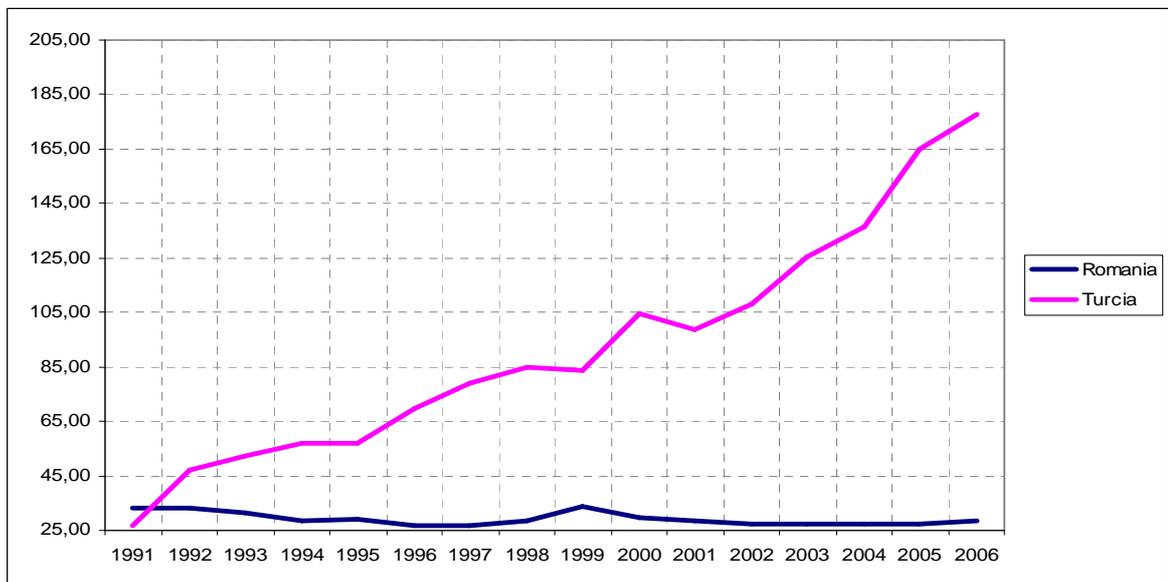**Figure 13. Real tax incomes/inhabitant 1991=100 (euro/inhabitant), Romania and Turkey**

Figure 14. Tax rate evolution (%), Romania and Turkey