A Quantitative Approach to Measure Tax Competitiveness Between EU Countries

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Abstract

The basic purpose of the study is to find a metric-variable of competitiveness for each country's tax regime and to assess the impact of tax regime differentiation across the common market. A country adopting competitive taxation policies manages to attract productive factors, funds and investments from other intra- and inter-countries. The value added tax (VAT), property tax as well as corporate and personal taxes are examined for the twenty seven (27) European Union (EU) countries. The methods applied consist of Least Square Dummy variable models and the results from the estimations for each one of the aforementioned taxes are integrated into a new total competitiveness taxation index (TCTI), following weighted hierarchical quantitative approaches. Our findings suggest that significant differences still exist between the countries examined and the application of diverse tax regime systems results in various tax performances. Using the above procedure, we also find that subgroups exist within the (27) EU countries and that EU lacks taxation policies with common rules or restrictions. Following the TCTI methodology proposed by this research, a tool for monitoring EU tax regimes is introduced in order to assist in the EU integration to a common tax regime.

Keywords: Taxation, Public Economics, Tax Regime Structure, Quantitative Methods

JEL Classification: H20, C00, R00

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1. Introduction

Following the work of Stuckler et al. (2010), Wilkes (2009a; 2009b), Peeters (2009; 2010; 2012), Schwarz (2007), Smith and Webb (2001), Munin (2011), and Navez (2012), the tax system applied in a country has a serious impact on cross-country competitiveness, something that, in turn, impinges strongly on the actual economy of common markets such as the EU and the differences among tax regimes diversifies homogeneously. The differences and imbalances between EU countries reflect the different tax regime structures applied and this problem seems to have also a spatial character imposing a significant regional problem for the EU, and especially EMU countries, that already have a common currency and monetary policy. On the other hand, the mobility of productive factors is directly related to the country tax-regime differences, government budget funding from tax revenues and rates, which are the main fiscal policy tools. 'Taxing the rich' is a policy based on taxes increase against the recent financial crisis and carries a considerable populist appeal (as many hold those involved with the banking system responsible for the crisis and believe they should pay its price, though this happened only in the case of Ireland and not in other PIIGS countries). A key problem with the current debt crisis is that public spending is increased with slower pace than decreased tax revenue. However, some commentators argue that taxing bonuses and high incomes may stifle incentives for entrepreneurship and innovation.

In this research, the tax regimes of EU countries are analyzed in the following parts in order to present the current situation and to find the level of tax effectiveness per country's tax regime. The general rule (strongly positive correlation between tax rate and tax revenue) is not followed by the countries with significant differences in tax legislations and problems in collecting taxes. Musgrave and Musgrave (1973) argued that, obviously, the tax rate directly affects the amount of tax revenue and deviations from the rule of proportional change, between tax rate and volume of tax revenues, indicate: instability in tax performance among countries; the existence of problematic tax legislation in the countries (tax-free, tax deductible, tax exempt amounts and differences in tax rates per incremental level of tax base); tax evasion or failure of tax authorities in collecting taxes or replacement taxable amounts with tax exempt income or with income classified to other tax base with lower tax rate. The article analyzes and introduces a metric for all the above mismatches in direct and indirect taxation of EU countries. On the other hand, the tax regimes of EU countries are analyzed in the following sections in order to present the current situation and to find the structure, the trends and the similarities among applied tax regimes. The work presented herewith, also examines the implementation of fair and unfair taxes and the adequacy of each country's tax system and legislation.

2. Data, methodology and estimations

Firstly, the tax regimes of the EU countries are analyzed for the period from 1995 to 2011. The general categories of taxes are then separated into indirect and direct taxes.

Finally, at the lower level, only the three main taxes (VAT and taxes on personal and corporate incomes) are presented.

The analysis data are mainly collected from the OECD (2011) and EUROSTAT databases. The observations are yearly, starting from 1995 until 2011. There are cases where some observations are missing, but since simple descriptive statistics and panel unbalanced methodology are used, no bias is expected.

In order to present similarities between EU countries, a collection of samples from tax variables is gathered, in order to group these samples into homogeneous tax regime groups of EU countries. The most suitable diagram to analyze similarities, using deceptive statistics, is *radar*. When the line of diagram is cyclic, common structure of tax volumes between countries is expected, otherwise, serious imbalances exist.

The more suitable method to find similarities between tax regimes among countries and to classify them into separate groups of countries with similar tax regimes is the Multi sample case of Cluster analysis (Mardia et al., 1979). In this work, the Multi sample problem of Cluster analysis for tax variables is analyzed as follows:

Let $x_{ij}, i = 1,\ldots,n_j$ be the observation in the j^{th} samples for the tax variables *j=1, 2,...,m.* The aim of cluster analysis is to group the *m* samples into *g* homogeneous classes where *g* is unknown, with $g \leq m$. The clustering methods are optimization partitioning techniques since the clusters are formed by optimizing a clustering criterion. According to these hierarchical methods, once an object is allocated to a group, it cannot be reallocated as g decreases, unlike the optimization techniques. The end product of these techniques is a tree diagram (Dendrogram). In this study, the maximum similarities within groups and minimum similarities between groups as hierarchical methods are used. These techniques operate on a matrix of squares of distances $D = \left(d_{ij}\right)$ between the points $x_1,\ldots,x_n$ rather than the points themselves. The distant matrix is the Euclidian distance:

$$d_{ij}^2 = \sum_{k=1}^{p} (x_{ik} - x_{jk})^2 = \left| x_i - x_j \right|^2 \tag{1}$$

where: *x* an *(n x p)* data matrix

In the Data Matrix, the EU countries are included (therefore, cases are *j=27*). The variables used for the production of similarities between countries are separated in the tax variables according to the three taxes which are examined as percentages of Gross Domestic Product (GDP), as percentage of Public Revenues from Total Taxation, as high rate or implicit rate of each tax category for the year 2011 (so, variables are *p=3*). Also, using all kind of taxes together and for the years 1995, 2000, 2005, 2009 and 2011 (variables are *p=69*) in order to find the global classification into groups of similar tax regimes. For estimation purposes, only rates, percentages and movements are used to avoid the analysis being influenced by the original sizes of variables.

To measure the imbalances, the methodology employed includes panel regression analysis (analyzing determining factors). The panel regression analysis is carried out with a Pooled regression analysis (Ordinary least squares in panel data) and *Least Square Dummy*

variable (LSDV) or fixed effect Pooled regression analysis (Wooldridge, 2002; Baltagi, 2005). LSDV models differentiate from a simple Ordinary Least Square model in the intercept term, because a different intercept is calculated for each individual by introducing Dummy variables for each one of the group. The advantage of Dummy variables' use is to test for different constant slopes for independent variables and to highlight any constant variance across groups. More simply, Dummy variables enable the estimation of an unknown time constant effect in the model operation, which is unmeasured by the data. If the condition of an unmeasured effect exists and it is significant, this might be the corner stone to introduce a new variable in the model. The move from Pooled regression analysis to LSDV happens only in failure of the first methodology to provide strong and unquestionable results.

Assuming the general principal that tax revenues must be strictly correlated with tax ratio. According to the tax theory and practice, tax revenue is a function of tax rate multiplied by the tax base of each tax. The tax base is a part of GDP or Gross Domestic Income or National Worth. But the volume of each tax base has been established by each country's tax authorities, tax legislation and the structure of the economy. For that reason, if one wants to find the differences between countries' tax legislations, a base measurement like GDP is used, to represent the tax revenues for all taxes. Thus:

$$TR_{ij} = a + br_{ij} + u \tag{2}$$

where:

TR tax revenues per kind of tax as percentage of GDP and

α a constant component representing the uncorrelated and stable part of tax revenues. This constant variable is introduced to the model in order to find an average amount for tax revenue of each country as a percentage of GDP for all EU countries. In real terms, *the above variable reflects the total ability of Europe to Collect Taxes.* This assumption of the study is critical in order to subsequently find the level of each country's diversification against European common practice. This assumption is expected to differentiate the estimated tax revenue elasticity against its tax ratio. Also, it is a necessary assumption for the model because, as Laffer (2004) explains, the Laffer Curve illustrates the basic idea that changes in tax rates have two effects on tax revenues: the arithmetic effect and the economic effect. The arithmetic effect is simply that if tax rates are lowered, tax revenues (per euro of tax base) will be lowered by the amount of the decrease in the rate. The reverse is true for an increase in tax rates. The economic effect, however, recognizes the positive impact that lower tax rates have on work, output, and employment – and thereby the tax base – by providing incentives to increase these activities. Raising tax rates has the opposite economic effect by penalizing participation in the taxed activities. The arithmetic effect always works in the opposite direction from the economic effect. Therefore, when the economic and the arithmetic effects of tax-rate changes are combined, the

consequences of the change in tax rates on total tax revenues are no longer quite so obvious. Similarly, the curve is often presented as a parabolic shape. By using the constant variable in the model, the economic effect can be eliminated by dodging the prohibit part of the Laffer's curve and cut the effective part into two components, the constant part and the arithmetic part, using the *b* (BETA) effect on tax rates

b the arithmetic effect (BETA) according to the Laffer's Curve (outside prohibit area)

r tax ratio per kind of tax

i the years of our sample (from 1995 to 2011)

j the countries of our sample (from 1 to 27)

u the stochastic term.

In this early stage, it is expected that the data sample used entails insignificant fluctuation/volatility (since tax revenues show volatility under rare circumstances only) so that our estimations are auto-correlated. For this reason, an auto-regression scheme of low order $AR(1)$ is introduced, in order to adjust the auto-correlation in residuals, without significant effect on estimated variables. Accordingly, the model is transformed to:

$$TR_{ij} = a + br_{ij} + AR(1) + u \tag{3}$$

Then, in order to isolate all other components, a search is conducted for any common coefficient not measured by the data which is common between countries and affects the revenues from income tax. This search will further enlighten the basic question of the study, that is: *'can we find a metric-variable of effectiveness for each country's tax regime?'*. The methodology applied in order to search for an unknown unmeasured effect in the model is pool data regression with fixed effects, which is actually a dummy variable for each country [Cross Section Fixed Effect (CSFE) per Country]. This dummy variable substantially differentiates the constant variable against average constant variable of Europe and thus the ability of each country to collect taxes. As a result, the model is changed to:

$$TR_{ij} = a + br_{ij} + CSFE_{j} + AR(1) + u \tag{4}$$

Thus, the model is historically simulated outside the prohibited part of Laffer's Curve and auto-correlation problem and provides for the CSFE variable the quantitative diversification as percentage of GDP. The data and estimations used (Tables 1 and 2) together with all corresponding (radar and dendrogram) graphs are given below using the above methodology.

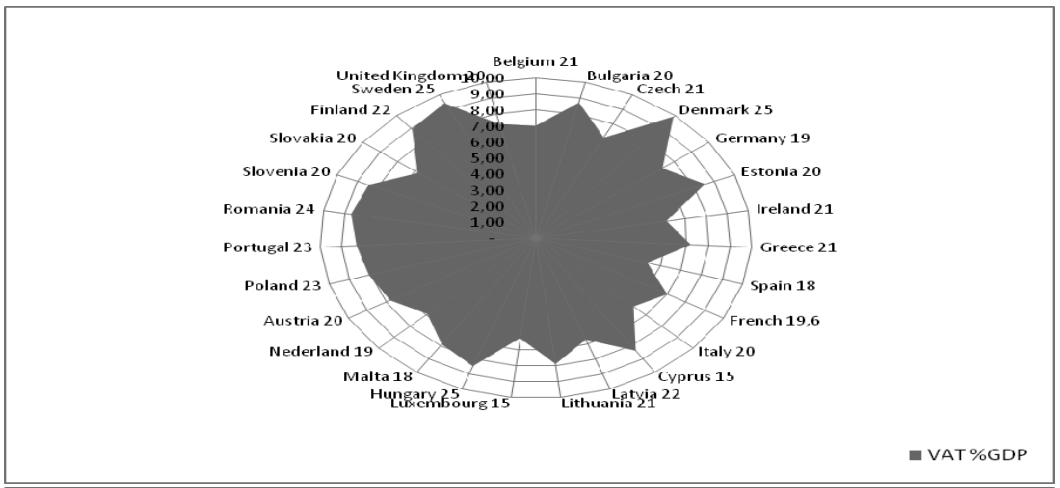
Table 1: Data used per EU country and average (VAT, Personal Income and Corporate Income)

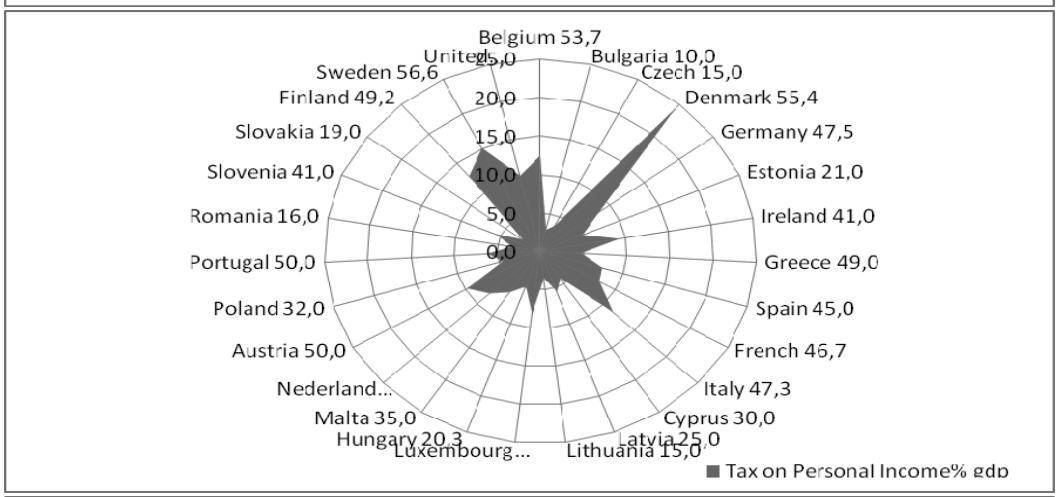
	VAT H. RAT.		VAT % GDP		PI H. RAT.		PI % GDP		CI H. RAT.		CI % GDP	
Country / Year	**2011**	**Δ(00-11) %**	**2011**	**Δ(00-11) %**	**2011**	**Δ(00-11) %**	**2011**	**Δ(00-11) %**	**2011**	**Δ(00-11) %**	**2011**	**Δ(00-11) %**
Austria	20.0	0%	7.8	-4%	50.0	0%	9.7	-3%	25.0	-26%	2.3	6%
Belgium	21.0	0%	7.0	-2%	53.7	-11%	12.4	-6%	34.0	-15%	3.0	-7%
Bulgaria	20.0	0%	8.7	5%	10.0	-75%	2.9	-29%	10.0	-69%	1.9	-30%
Cyprus	15.0	50%	8.4	46%	30.0	-25%	4.2	16%	10.0	-66%	6.8	11%
Czech	20.0	-9%	7.0	9%	15.0	-53%	3.7	-18%	19.0	-39%	3.4	-4%
Denmark	25.0	0%	9.9	4%	51.5	-14%	24.3	-5%	25.0	-22%	2.8	-15%
Estonia	20.0	11%	8.5	1%	21.0	-19%	5.3	-23%	21.0	-19%	1.3	42%
Finland	23.0	5%	8.9	9%	49.2	-9%	12.8	-12%	26.0	-10%	2.7	-54%
French	19.6	0%	7.0	-4%	46.7	-21%	7.9	-6%	34.4	-9%	2.3	-18%
Germany	19.0	19%	7.3	8%	47.5	-12%	8.4	-18%	29.8	-42%	2.6	53%
Greece	23.0	28%	7.2	0%	45.0	0%	4.7	-5%	23.0	-43%	2.1	-49%
Hungary	25.0	0%	8.5	-2%	20.3	-54%	4.9	-32%	20.6	5%	1.2	-47%
Ireland	21.0	0%	6.2	-16%	41.0	-7%	9.2	0%	12.5	-48%	2.4	-37%
Italy	20.0	0%	6.2	-4%	45.6	-1%	11.5	0%	31.4	-24%	2.3	-7%
Latvia	22.0	22%	6.8	-4%	25.0	0%	5.6	1%	15.0	-40%	1.4	-10%
Lithuania	21.0	17%	7.9	5%	15.0	-55%	3.5	-54%	15.0	-38%	0.8	21%
Luxembourg	15.0	0%	6.3	13%	42.1	-11%	8.3	15%	28.8	-23%	5.0	-28%
Malta	18.0	20%	7.9	32%	35.0	0%	6.4	15%	35.0	0%	5.9	105%
Nederland	19.0	9%	6.9	0%	52.0	-13%	8.0	34%	25.0	-29%	2.2	-49%
Poland	23.0	5%	8.1	16%	32.0	-20%	4.5	1%	19.0	-37%	2.1	-14%
Portugal	23.0	35%	8.3	9%	46.5	16%	6.1	15%	29.0	-18%	3.2	-14%
Romania	24.0	26%	8.7	34%	16.0	-60%	3.3	-4%	16.0	-36%	2.2	-27%
Slovakia	20.0	-13%	6.8	-2%	19.0	-55%	2.5	-26%	19.0	-34%	2.4	-8%
Slovenia	20.0	5%	8.4	-3%	41.0	-18%	5.6	-1%	20.0	-20%	1.7	45%
Spain	18.0	13%	5.4	-11%	45.0	-6%	7.4	12%	30.0	-14%	1.9	-40%
Sweden	25.0	0%	9.4	10%	56.4	10%	15.0	-17%	26.3	-6%	3.4	-8%
United Kingdom	20.0	14%	7.3	12%	50.0	25%	10.1	-7%	27.0	-10%	3.1	-13%
Average	**20.7**	**9%**	**7.7**	**6%**	**37.1**	**-18%**	**7.7**	**-6%**	**23.2**	**-27%**	**2.7**	**-7%**

Table 2: Pooled Least Squares Method with constant term and *AR*(1) and CSFE per EU country

Method: Pooled Least Squares			**Sample (adjusted): 2001 - 2011**			
Included observations: (11) after adjustments			**Total pool (balanced) observations: (297)**			
Convergence achieved after (8) iterations			**Cross-sections included: (27)**			
Variable	**Coefficient**			***CSFE Coefficient***		
Dependent Variable:	**VAT**	**Personal**	**Corporate**	**Country**	***VAT***	***Personal***	***Corporate***
C	5,789491	6,319855	2,018287	Austria	0,254795	1,857277	-0,622995
Std, Error	*0,51176*	*0,313633*	*0,267802*	Belgium	-0,77722	4,126533	-0,143969
t-Statistic	*11,31291*	*20,15046*	*7,53649*	Bulgaria	1,798561	-4,032996	0,059118
Probability	*0,0000*	*0,0000*	*0,0000*	Cyprus	2,294573	-3,532344	3,429618
HVR (Tax Ratio)	0,092775	0,041038	0,036488	Czech	-0,74816	-3,186632	0,900406
Std, Error	*0,025604*	*0,007564*	*0,009653*	Denmark	-0,63506	0,795203	-1,875295
t-Statistic	*3,623392*	*5,425467*	*3,780082*	Estonia	1,879492	16,26535	0,094609
Probability	*0,0003*	*0,0000*	*0,0002*	Finland	0,950718	-1,326469	-1,514836
AR(1)	0,596571	0,736062	0,705964	French	-0,53685	-3,287055	-0,364623
Std, Error	*0,045253*	*0,031509*	*0,033835*	Germany	-1,70789	-1,202289	-0,227684
t-Statistic	*13,18297*	*23,36057*	*20,86492*	Greece	0,733155	5,00259	0,63502
Probability	*0,0000*	*0,0000*	*0,0000*	Hungary	-0,56351	-0,338196	-0,850917
				Ireland	0,186896	-1,222622	-0,761342
R-squared	0,883651	0,992249	0,876038	Italy	-0,83618	0,559346	0,714512
Adjusted R-squared	0,871495	0,99171	0,867425	Latvia	-1,61154	3,142353	-0,680793
S,E, of regression	0,419012	0,437806	0,475957	Lithuania	-0,05916	-1,417826	-1,352212
Sum squared residuals	47,05298	77,2446	91,29378	Luxembourg	-1,11478	-0,585783	2,949983
Log likelihood	-147,82	-241,1486	-277,2434	Malta	-0,51981	-1,569029	-0,789604
F-statistic	72,69336	1842,426	101,7141	Nederland	0,290559	-1,665803	1,551234
Prob (F-statistic)	0,0000	0,0000	0,0000	Poland	-0,3463	-1,544861	0,291774
				Portugal	-0,06905	-3,383942	-0,598441
Mean dependent var	7,583096	8,089249	3,00758	Romania	0,410911	-2,566703	0,147154
S,D, dependent var	1,16887	4,808468	1,307186	Slovakia	0,068022	-4,431389	-0,036489
Akaike info criterion	1,190705	1,250688	1,417793	Slovenia	1,11042	8,341413	0,127922
Schwarz criterion	1,551373	1,5238	1,690905	Spain	0,811715	-2,554772	-0,894738
Hannan-Quinn criterion	1,335093	1,358511	1,525617	Sweden	-0,50738	-4,406483	-0,497401
Durbin-Watson stat	1,942382	1,729775	1,780412	United Kingdom	-0,75694	2,165126	0,30999

Figure 1: Tax similarities between EU countries for the year 2011 (Radars)





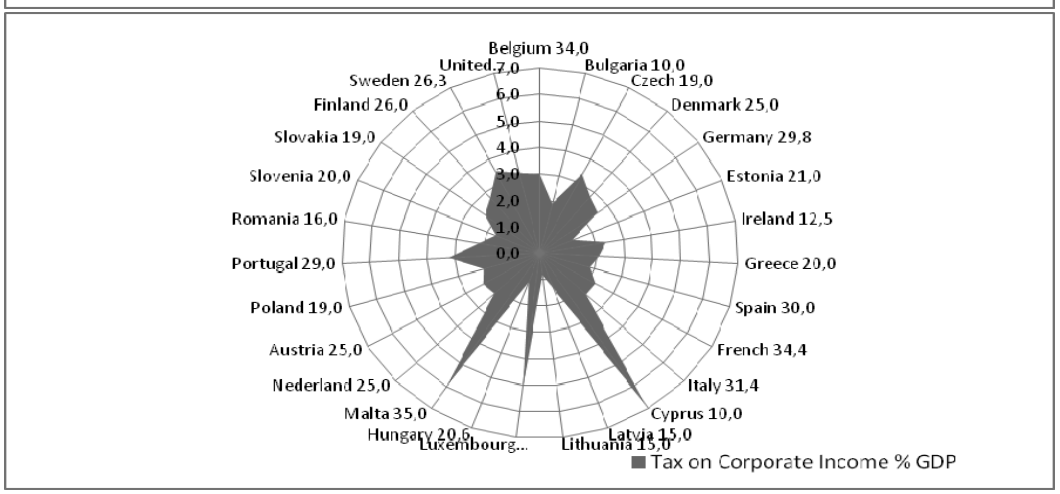
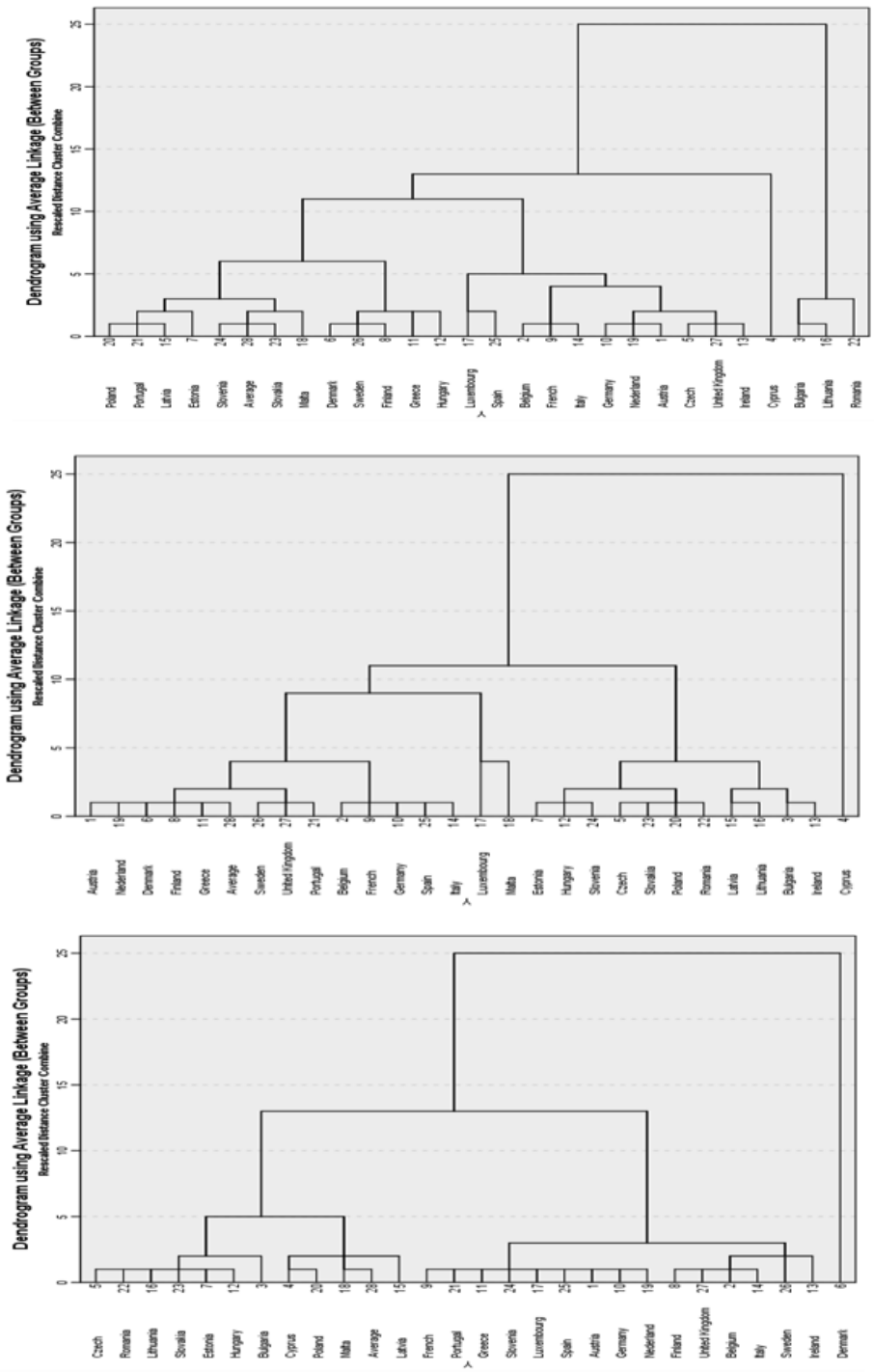


Figure 2: Tax similarities (VAT, Personal & Corporate respectively) between EU countries' groups (Dendrograms)



3. Analysis of the findings for vat and direct taxes on personal and corporate incomes

VAT is the main indirect tax on consumption and an attempt to EU VAT grouping can be found in Vyncke (2009). Table 1 presents the high ratios, the revenues of tax as percentage of GDP and the revenues of tax as percentage of total tax revenues for the years 2000 and 2011 together with the *differences* between these years (also as either a *positive or negative percentage*). Using the above data for the year 2011 a radar diagram with VAT similarities between EU countries is produced as shown in Figure 1. The axe of the radar presents the tax revenue as a percentage of GDP and the periphery consists of the countries and tax ratio. By observing the above diagram, no major differences exist in VAT among EU countries with an interval between 7% to 9% tax revenues from each country's GDP. In order to classify EU countries into similar groups, a Dendrogram of similarities is produced following multivariate cluster analysis by using percentages of GDP, percentage of Public Revenues from Total Taxation and high rate or implicit rate of tax for the year 2011. Figure 2 presents the similarities between groups among EU countries. At the lowest level of similarity, (8) different groups are produced from countries with similar characteristics of VAT regime structure and at the upper level Cyprus and the block of countries Bulgaria, Lithuania and Romania have quite different VAT tax regimes. Then, the relationship of indirect taxes (VAT) as percentage of GDP (ITV) with high tax rate of VAT (HVR) is examined. Panel least square methodology is applied first to indirect taxes and more specifically to VAT. Indeed, as per the assumption made, results suggest that the residuals suffer from auto-correlation. R-square value further strengths the outcome that this model is not adequate in this form. Therefore, we continue by inserting an $AR(1)$ to absorb the auto-correlation in residuals. The problem of auto-correlation in residuals is adequately solved. All coefficients are significant. The high VAT ratio coefficient is very low. A rise of 1% in high VAT ratio will have an impact of 0,098% on indirect taxes as percentage of GDP, considering all the other parameters stable. If taxation on high rate policy is avoided and the high VAT tax ratio is set to zero, then indirect taxes as percentage of GDP will still provide earnings (constant term). The R-squared is strong, approaching the 85,15%. The next step is to introduce the fixed effect term in pooled data. Results of final estimations are shown in Table 2. The outcomes of pool regression do not deviate from the panel analysis. Again the coefficient of income tax rates is very low, $AR(1)$ is significant and the fit of the model in data is 88,37%. If there is a rise in VAT tax ratio by 1%, this will cause a slight positive change in indirect taxes as percentage of GDP by 0,092%, considering all the other parameters unchanged. The Cross-section fixed (dummy variables) Fixed Effects (Cross) is the quantitative index which distinguishes the countries measuring imbalances. The values of VAT imbalances are also shown in Table 2. Fixed effect figure above, further highlights the notion that there is a major tax evasion in the core of EU. Spain, Germany, France, Italy, Belgium have negative fixed effect term, which is a strong indicator that the earnings from high ratio tax policy are reduced for an unrecognized factor. On the other hand the weak core of EU maintains better results

from the high ratio tax policy. The interesting part is that the Cypriot economy manages to maintain strong earnings from this unmeasured factor, which has an additive role to high tax ratios policy. Moreover, if there is any intention EU countries to move close to a tax union, this kind of indirect tax will have ambiguous results.

Table 1 also presents the high ratios, the revenue of each tax as percentage of GDP and the revenues of each tax as percentage of total tax revenues for the years 2000, 2011 and the differences as percentage between these years. Significant differences exist in the tax structure on income (Personal, Corporate and Other) between EU countries. The corporate and other income taxes remain at a lower level against Personal income taxes in many countries and as an average in the EU market, which denotes that personal income remains as the main income base for the direct taxation. Using the above data for the year 2011 the radar diagram of Figure 1 is produced. The axe of radar presents the tax revenue as percentage of GDP and the periphery consists of the countries and tax ratio. According to the diagram, low homogeneity exists for the volumes of personal income between EU countries. In order to classify into similar groups the EU countries a Dendrogram of similarities is produced following multivariate cluster analysis by using percentages of GDP, percentage of Public Revenues from Total Taxation, and high rate or implicit rate of tax for the year 2011. Figure 2 indicates which groups among EU countries are similar. At the lowest level of similarity, (5) different groups are produced with countries with similar characteristics of Personal tax regime structures and at the upper level Denmark has quite different VAT tax regime. It should be mentioned that ex-eastern EU countries belong to a separate group. The relationship between Personal Taxes as percentage of GDP and top personal income tax rates, including a constant term. Once again, results suggest that the model suffers from auto-correlation. Therefore, an $AR(1)$ factor is used to absorb the auto-correlation in residuals. The problem of auto-correlation is solved, but the constant term is not significant and should be omitted from the model. There is a positive relation between tax ratio and personal income taxes. However, it is noticed that a rise of 1% in tax ratio will only increase the tax revenues from personal income by 0,03%. As far as it concerns the statistics of the model, the fit of data is very good approaching 99% and $AR(1)$ term is significant. The final step is to insert the dummy variables, with the results also shown in Table 2. The outcomes of the pool regression do not deviate from the panel analysis. Again, the coefficient of income tax rates is very low, $AR(1)$ is significant and the fit of the model in data is 99,2%. The Cross-section fixed (dummy variables) Fixed Effects (Cross) is the quantitative index that distinguishes countries measuring imbalances. The values of imbalances are provided in the Table 2. The constant term is significant suggesting that there is an unmeasured common effect, which is positive in the common sample. The cross section fixed effect has different signs. It is noticed that the strong European Economies have a positive fixed effect that increases the revenues, when a higher tax rate is imposed (Austria, Belgium, Germany, Denmark, Finland, Sweden and United Kingdom). Surprisingly, France and Nederland have negative fixed effect, which is lowering incomes from personal tax revenues. On the other hand, Italy and Ireland have identical characteristics with the core countries. All strong economies have high personal income tax rates, with sufficient results in tax revenues. On

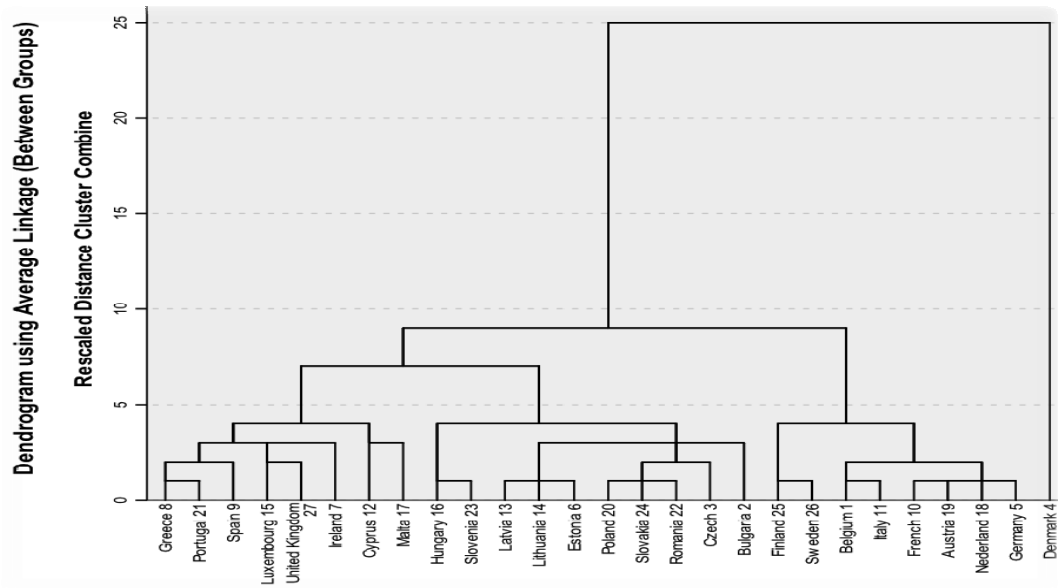
the other hand high Personal Tax policies in weak economies do not produce substantial revenues. The last (3) countries in terms of Fixed Effects Value (Romania, Slovakia and Bulgaria) lowered the personal income taxes during the last years. From the results, one can extract the outcome that high tax on personal income does not provide sufficient results on weak economies. One reason for this inability to increase the revenue with high taxes might be a high level of tax evasion these countries may suffer. Figure 1 shows the high tax ratio and the volume of tax as percentage of GDP between EU countries for the year 2011. According to the diagram low homogeneity exists for the volumes of corporate income between EU countries. Cyprus, Malta and Luxembourg as international corporate centers have high level of volumes and, on the other hand, Germany has the lowest volume as percentage of GDP from all other countries. In order to classify into similar groups the EU countries a Dendrogram of similarities is produced following multivariate cluster analysis by using percentages of GDP, percentage of Public Revenues from Total Taxation, and high rate or implicit rate of tax for the year 2011. Figure 2 presents which are the similar groups among EU countries.

The last direct tax is analysed in this part. In the beginning, direct taxes on Corporate Income as percentage of GDP and Corporate income tax rates relation are estimated with Panel Least Squares. Similarly, residuals suffer from auto-correlation. R-square is approaching to zero. Therefore, an *AR*(1) is inserted to absorb the auto-correlation in residuals. Corporate tax rate has a positive and significant relation with revenues from corporate tax. The coefficient value of the corporate tax is rather low. As an example, if corporate tax rate is increased by 1%, revenues will increase only by 0,04%. The statistics of the model are very good with the fitness of model on data approaching around 85%. The Cross-section fixed (dummy variables) Fixed Effects (Cross) is the quantitative index which distinguishes countries measuring imbalances (Table 2). Pool data analysis outcomes provide the same result as panel analysis. A rise in corporate tax will not provide more revenues, since the coefficient of tax rate is very low. As an example, if corporate tax rate is raised by 1%, then revenues from corporate tax will raise by 0,036%, considering all other parameters stable. There exists an unmeasured factor that is not explained by the data and has positive overall effect on tax revenues. However, the cross sectional fixed effect provides ambiguous results; no certain trend can be traced in the results of fixed effects. On statistical view, the model fits very well on data by approaching 87%. *AR*(1) term is significant and does not change the outcomes of the model. Cross sectional fixed effect graph provides an interesting point. Concerning the fixed effect adding character on corporate revenues, that is not measurable by the data, the countries with the higher fixed effect are Cyprus, Luxemburg and Malta, which are considered as Tax Heavens and with their policies drag Foreign Direct Investments. Cyprus has a very low corporate tax regime. Malta's corporate tax is very high in relation to EU standards, but with the ongoing policy a large amount of tax is refunded back to the companies. Luxemburg may not provide direct tax conveniences in companies, but a lenient tax regime on financial institutions attracts a large portion of EU funds and investors.

4. EU tax regimes structures similarities

In conclusion, corporate tax regime does not provide substantial outcomes. Policies that provide convenience for direct investments will substantially increase the tax revenues. Using Euclidian Distance and average linkage between groups, for all kinds of taxes the cluster of similarities between EU countries is produced. These similarities are presented below in Figure 3.

Figure 3: Similarities between EU countries' tax regimes



According to this global estimation, EU countries are grouped in (3) main separate groups, with obvious evidence that in the classification there is a spatial character. The first large group consists of (3) subgroups; in the first subgroup including Greece, Portugal and Spain, old members of EU at the Southern Europe facing Debt Crisis nowadays and characterized by problems in tax performance; the second subgroup is consisted by Luxembourg, United Kingdom and Ireland, old members with developed financial sector facing Financial Crisis and characterized by similar tax regimes; the third subgroup is consisted by Cyprus and Malta the newest from old members of EU with International corporate sector and characterized by similar tax regimes.

The second large group consists of Eastern European countries, new members of EU, characterized by problems or instability in tax performance and consists of (2) subgroups; in the first subgroup including Latvia, Lithuania and Estonia; the second subgroup consists of Poland, Slovakia, Romania and, slightly, Bulgaria.

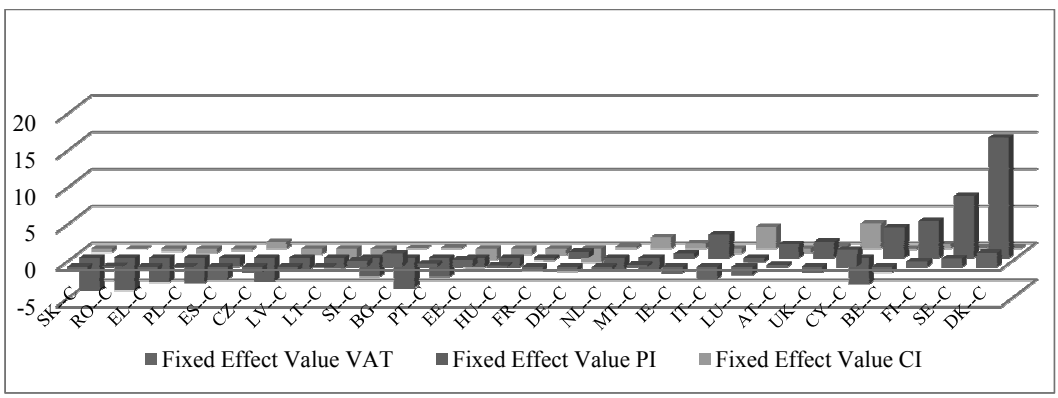
The third large group consists of Central European countries, old members of EU,

characterized by stable, balanced or high tax performance and consists of (3) subgroups; the first subgroup includes Finland and Sweden, the North European countries; the second subgroup is consisted by Belgium and Italy; the third subgroup is consisted by France, Austria, Nederland, Germany, the Central and more developed EU countries; at the end, with a different tax regime from all other EU countries, Denmark stands alone.

The differences and imbalances between EU countries reflect different tax regime structures and this problem seems to have also a spatial character and will pose a serious regional problem for the EU, and especially EMU countries, which already have a common currency and monetary policy.

This research managed to identify a measurement for imbalances. The introduction of the constant variable, common in all EU countries, measured as percentage of GDP embodying a common Tax Collection base, which is the desired outcome in a union of countries. However, this constant term is increased or reduced depending on which country is focused. This is achieved, with the introduction of the dummy variable, which alters the outcome and give us a clear and unambiguous measurement of tax regime diversification per country. A comparative analysis by providing all these measurements for VAT, Personal Tax and Corporate Tax is summarized in Figure 4.

Figure 4: Measurements of EU Tax Imbalances



Gathering all the Fixed Effect values estimated for the (3) different taxes, it is noticed that the results do not deviate from the outcomes of the work using multivariate cluster analysis but now a measure for this exists. Countries that face crisis seem to face the largest portion of imbalances. In addition to that, the spatial problem between North and South Europe is obvious, which is mainly caused by the different tax regime of these (2) tiers.

5. Conclusions

Generally, the differences and imbalances between EU countries reflect different national economic legislation and fiscal policies like: imbalances in mobility of productive

factors; differentiations in the current account of balance of payments; different levels of expansion in loans and advances or in use of financial or credit products; different deficit and government debt; different unemployment and gross wage revenues per country.

The problem seems to have also a spatial character and will pose a serious regional problem for the EU. The south of Europe is faced with crisis. Policies to reduce the government debt will lead to social discontent, and ultimately the collapse of the European Union.

The only policy that seems to be efficient is full integration of the countries with a common fiscal and federal face and legislated solidarity thus, the public choice has to be a common tax regime for all EU countries which eliminates imbalances and allows mobility of capital and labour.

Nowadays, there are significant differences among the applied tax regimes in EU countries and no policy has been implemented to ensure tax homogeneity across the EU, nor is there any likelihood of such. Even if, EU moves to a common taxation policy, there are obvious indications that it will fail to balance revenues from taxations at the same levels.

On the other hand, the 'strong' EU countries, which in reality enforce their own economic policies (mainly designed from their own economic systems), might need to redefine their attitude towards the non-homogeneity of the tax regime in the EU. Countries that are thought to be economic paradises, are actually achieving better results in tax revenue collection. A more loose taxation system might have better results in tax revenue collection.

A major question emerges regarding the performance of any taxation as a percentage of each country's GDP. Following the outcomes of this study, the taxation imbalances between EU countries can be measured through the use of quantitative tools to analyze collected data from the National Organizations and with the introduction of the constant term (common historical performance per tax avoiding Laffer's problem), the elasticity against tax ratio (net historical BETA of tax ratio without common historical performance of tax – an introduced by this work net arithmetic effect following Laffer's research) and dummy variable (the quantitative diversification per country as percentage of GDP, also introduced by this paper). Using these three parameters the alteration of the outcome can be achieved, thus giving a clearer and unambiguous measurement of tax regime diversification per EU country as a percentage of each country's GDP. Deviations from the rule of proportional change, between tax rate and volume of tax revenues that take into account the common historical performance per tax, indicates: instability in tax performance among countries; the existence of problematic tax legislation in the countries (tax-free amounts, tax deductible amounts, tax exempt amounts, and differences in tax rates per incremental level of tax base); the tax evasion or failure of tax authorities in collecting taxes or replacement taxable amounts with tax exempt income or with income classified to other tax base with lower tax rate. Under this view, the proposed measurement has obvious practical benefits to any fiscal policy maker.

The study shows the significant difference in performance between EU countries

when collecting VAT as well as the significant difference in the tax structure on income (Personal and Corporate) between EU countries. The Corporate tax remains at a lower level against Personal income taxes in many countries and on average in the EU market which denotes that personal income remains as the main income base for the direct taxation. Significant decreases also exist in the tax rates of direct taxes for all EU countries. The decreases of tax rates on corporate income remain at a higher level against tax rates on personal income. Low homogeneity exists in the volumes of personal income tax revenues as well as in the volumes of corporate income tax revenues. Cyprus, Malta and Luxembourg as international corporate centers have high level of volumes and, on the other hand, Germany has the lowest volume as % of GDP from all other countries.

The general rule (strongly positive correlation between tax rate and tax revenue outside the prohibit part of Laffer's Curve) is not followed by the countries, indicating significant differences in tax legislations and problems in collecting direct or indirect taxes. These differences could be measured as a percentage of GDP using the proposed dummy variable coefficients per country contributing with practical and secure way, far from indistinct calculations.

Further implementation of more variables like taxation regimes, structure and economy, might highlight in more depth, the main forces that shape this diversification per country, but always aware of the over parameterization risk and biased results.

This study focused on imbalances of fiscal policies for countries – members of a Common Economic Union contributes such to the debate as to the implementation of a common tax regime by analyzing and measuring the present situation with future perspectives.

References

Baltagi, B.H., 2005, *Econometric Analysis of Panel Data, Third Edition*, West Sussex, England: John Wiley & Sons, pp. 12-14.

Laffer, A.B., 2004, 'The Laffer Curve: Past, Present, and Future', The Heritage Foundation, 1765.

Navez, E-J., 2012, 'The Influence of EU Law on Inheritance Taxation: Is the Intensification of Negative Integration Enough to Eliminate Obstacles Preventing EU Citizens from Crossing Borders within the Single Market?', *EC Tax Review,* 21, 2, pp. 84–97.

Mardia, V.K., Kent, J.T. and Bibby, J.M., 1979, *Multivariate Analysis*, Academic Press, London.

Munin, N., 2011, 'Tax in Troubled Time: Is It the Time for A Common Corporate Tax Base in the EU?', *EC Tax Review*, 20, 4, pp. 121-133.

Musgrave, A.R. and Musgrave, B.P., 1973, *Public Finance in Theory and Practice*, McGraw-Hill, New York.

Peeters, B., 2009, 'European Guidelines for Federal Member States Granting Fiscal Competences c.q. Tax Autonomy to Sub-national Authorities', *EC Tax Review*, 18, 6, pp. 50-52.

Peeters, B., 2010, 'Tax Sovereignty of EU Member States in View of the Global Financial and Economic Crisis', *EC Tax Review*, 19, 3, pp. 236-237.

Peeters, B., 2012, 'Tackling Cross-Border Inheritance Tax Obstacles within the EU', *EC Tax Review*, 21, 2, pp. 54-56.

Schwarz, P., 2007, 'Does capital mobility reduce the corporate-labour tax ratio?', *Public Choice*, 130, 3-4, pp. 363-380.

Smith, E., and Webb, J.T., 2001, Tax Competition, Income Differentials and Local Public Services, International Tax and Public Finance, 8, 5-6, pp. 675-691.

Stuckler, D., Basu S., McKee, M. and Suhrcke, M., 2010, 'Responding to the economic crisis: a primer for public health professionals', *Journal of Public Health*, 32, 3, pp. 298-306.

Vyncke, K., 2009, 'EU VAT Grouping from a Comparative Tax Law Perspective', *EC Tax Review*, 18, 3, pp. 299-309.

Wilkes, G., 2009a, 'A Balancing Act: Fair Solutions to a Modern Debt Crisis', London: Centre Forum.

Wilkes, G., 2009b, 'Slash and Grow? Spending Cuts and Economic Recovery', London: Centre Forum.

Wooldridge, J.M., 2002, 'Econometric Analysis of Cross Section and Panel Data', Cambridge, MA: The MIT Press, pp. 265-275.

Authorities electronic Publications and Databases

OECD, 2011, Revenue statistics: Comparative tables, OECD Tax Statistics (database), http://www.oecd.org/statsportal

Publication Office of the European Communities, EUROSTAT (database):
http://publications.europa.eu/index_en.htm
http://ec.europa.eu/taxtrends and
http://ec.europa.eu/eurostat