The Flat Taxation and Economic Development. A Panel Data Analysis of EU Countries

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Abstract. *The dilemma of the application and the implications of the types of taxation and the comparison between progressive versus flat tax systems has become a topic of great interest both in academic environment and at the level of the decision-makers. There are numerous debates regarding the application/replacement of one system with the other. Through this research, we intend to analyse a part of the implications of the flat tax system, namely its effects on the economic growth felt at the level of citizens in the case of the EU Member States that apply such a tax system. Thus, the study is focused on the impact of direct and indirect taxes on the growth of GDP per capita in the eight EU countries that applied the flat taxation for the period 2003-2018 explained by econometric models that use panel data built using the Stata software. The tax elements used were the revenues recorded from direct taxes: personal income tax, corporate income tax and social security contributions from both employees and employers and value added tax. In this respect, our expectations are that our results will reflect results similar to the latest findings in the specialized literature, and these models reflect a positive direct relationship between the GDP per capita and the independent variables. However, we consider that we could obtain a negative relationship between personal income tax and the GDP per capita, having in view that most of the results obtained in the past studies have shown this (with some recent exceptions).*

Keywords: Flat taxation, tax systems, economic development, panel data

JEL Classification: H20, H31, C33

1. Introduction

In the context of a continuous transformation of the global economy, the subject of taxation occupies an important place in the debates of academics, but also of the practitioners. Although economies are becoming more interdependent, regarding the tax systems, each country (EU or non-EU) can choose its own way of building its tax system.

Further, one of the main pillars of a tax system is the way of taxing citizens' income, and starting form this dilemma of progressive versus flat taxation, we propose within this paper a qualitative and quantitative analysis of the impact of taxation of economic growth at the level of EU countries applying a flat tax system.

A reason for analyzing the flat tax systems started from the small number of countries that still apply this type of taxation at EU level ("flat tax countries"), namely seven countries at this time and eight in the period under review. Particularly, such tax system is applied in the Central and Eastern European countries and in the former Soviet Union countries. As stated by Bird & Zolt (2011) [4], the application of flat tax system in these countries means in principle the lack of explicit marginal rate progressivity on personal income tax ("PIT") and if it is very well structured, this system simplifies the taxation and reduces the administrative and compliance costs, as stated by Hall & Rabushka (1995) [13]. Although at first glance, it seems a relatively less

complicated tax system than the progressive one, however, we find that during the last period it is not preferred among the EU countries.

Such a tax system can be perceived from several perspectives, but we can lean on the most important of them, namely the perspective of the legislator/state and that of the citizens. Thus, the perspective we are analyzing is to a certain extent combined, but mainly concerns the impact on citizens through the GDP per capita.

Our analysis focuses on the period 2003-2018, and the necessary data were extracted from the Eurostat database [29]. Besides PIT, we used data for corporate income tax ("CIT"), value added tax ("VAT") and social security contributions ("SSC") for both employees and employers.

According to the guides made available by the consulting companies PwC [30] and EY [28] the flat tax countries are: Bulgaria, Czech Republic, Hungary, Estonia, Latvia, Lithuania, Romania and Slovakia. However, Romania applied the flat taxation starting with 2005 and Slovakia applied this type of taxation until 2013. In order to obtain more conclusive econometric results, the numerical values of the included elements were transformed into percentage growth indices (from previous year).

Thus, starting from the specialized literature for which we made a brief synthesis in the next chapter and from the specific econometric methodologies, we built econometric models with panel data by using Stata software. The results for the econometric analysis are presented in chapter IV of this paper. At the same time, in order to better understand the evolution of the analyzed elements, we have included in our paper a chapter that contains a descriptive analysis that aims to form an overview of economies and tax revenues of flat tax countries.

2. Review of the scientific literature

In recent decades, the importance of applying an appropriate tax system to stimulate economic growth, as well as the impact of taxation on this growth, have often been the subject of studies in within the specialized literature, as the tax system transmits immediate effects on the economy.

At the same time, numerous studies have been elaborated on this dilemma of the type of taxation, progressivity versus proportionality, each study highlighting both advantages and disadvantages for each type of taxation. It is self-evident that the choice between these systems depends on many elements and is a very important decision from several points of view. According to Slemrod (1994) [17], such a decision must be based on the main economic problems of a country such as the magnitude of inequities or the behavior of the taxpayers.

In this regard, many authors have analyzed and identified the advantages, disadvantages and the impact of these systems. Nevertheless, since our paper is focused on the flat tax systems, we will mainly refer to the studies on this type of system. Thus, Shapiro (1996) [16] identified that the flat tax system can be seen as a system that respects the freedom of individuals and equally affects the taxpayers. Bikas et al. (2014) [3] appreciate that this system has positive effects on productivity since a uniform taxation of employees is applied, while Paulus & Peichel (2008) [15] associate this system with a low degree of evasion, but that negatively affects individuals with low income, and implicitly affects social justice in a negative manner.

The literature offers a wide range of studies on the advantages and disadvantages of tax systems, but we will further refer to studies that target the impact of taxation on the main elements of economies, including statistical/econometric studies in this regard.

The authors' concern for studying the impact of fiscal elements has been found in specialized literature for a long time. Therefore, authors like Bloom (1955) [5] Thompson and Mattilda (1959) [22] and continuing with Carlton (1979) [7] did not find a

relationship between the tax elements and the economic growth. The links between the fiscal elements and the economic growth, however, began to be revealed through subsequent studies made by authors such as Helms (1985) [14] who found there is a significant negative impact of state and local taxes on economic growth. Likewise, a certain correlation between the tax rates and GDP per capita was found in the case of developing countries was found by Burgess and Stern (1993) [6]. Later on, in recent decades, numerous authors (whether positive or negative) have discovered these correlations.

Regarding the use of econometric instruments, over time, the authors have used various tools to study the relationship between taxation and economic elements (mainly the economic growth).

Widmalm (2001) [26] used pooled cross-sectional data for the period 1965-1990 and found that at the level of 23 OECD countries the tax structure affects the economic growth in the sense that the personal income tax negatively affects the economic growth. Also, he found certain empirical evidence that the progressivity of tax is associated with a low level of economic growth. Dolenc & Laporsek (2010) [9] analyzed the impact of PIT on the employment growth in the case of EU27 Member States for the period 1999-2008 and, through a certain linear regression with panel-corrected standard errors, they found a negative relationship, namely that a reduction in taxes on labour could lead to an increase in the demand on labour and employment.

Szarowská (2013) [21] carried out an analysis for the period 1995-2010 on the effect of changes in tax burden on economic growth for 24 EU Member States based on panel regression and Pairwise Granger Causality Tests. The author found a negative effect of taxes on labour and a positive effect of consumption taxes. In addition, by the means of the regression analysis, Stoilova & Patonov (2012) [18] analyzed the impact of taxation on the economic growth and they found significant positive effect of the revenue from PIT and SSC on the long-term economic growth. We also mention certain studies performed on one of the flat tax countries, namely Romania. Thus, Bazgan (2018) [2] used a Vector Autoregressive model based on quarterly data. The author proved that a positive change in the structure of indirect taxes would have a strong positive on the economic growth over a medium-term period, while a positive change in the structure of direct taxes will have a negative impact on short-term, then returning to a positive impact.

In order to analyze the impact of taxes on the economic growth, Surugiu and Surugiu (2018) [19] used the classification of budget revenues in distortionary taxes, non-distortionary taxes and other taxes and for the period 1991-2013. Further, they use a regression model and found that distortionary taxes have a negative impact on economic growth, while the non-distortionary taxes have a positive impact. However, within a subsequent similar study Surugiu and Surugiu (2018) [20] only use the direct taxes (CIT and PIT) and indirect taxes (VAT) for the period 1995-2014 and they found that both variables have a significant positive impact on the economic growth.

Recent studies have approached similar topic, such as the following. Using a panel of 51 countries and the dynamic panel generalized method of moments estimation, Hakim (2020) [12] investigated the impact of direct and indirect taxes on economic growth for the period 1992-2016. The related results showed that direct taxes have a significant negative impact on the economic growth, while indirect directs have positive but insignificant impact on the economic growth. Having a similar goal, through Granger causality analysis using data over the period 1995-2015, Vatavu et al. (2019) [25] found that taxes support economic growth. Similar studies with similar results were also carried out by Durovic-Todorovic et al. (2019) [10], Dackehag & Hansson (2012) [8] or Topal (2019) [23].

A very similar study to the one we will carry out in this paper is represented by the one of Elshani & Ahmeti (2017) [11] on twenty European OECD countries that apply a progressive taxation system for the period 2002-2014. Thus, they analyzed the impact of taxation on economic growth by using panel data regression analysis having as dependent variable GDP per capita and the independent variables PIT, CIT and VAT. They found that PIT has a negative impact on economic growth in the countries with progressive taxation, while CIT and VAT have a strong positive impact on economic growth.

Thus, we observe that the specialized literature offers us a wide range of studies on this topic, including studies using especially econometric instruments.

3. The evolution of taxation and economic growth in flat tax countries

Before moving on the econometric analysis step, it is necessary to have an overview of the elements included in the analysis and to be able to compare their evolution at the level of the countries applying the flat taxation.

In this regard, within this chapter we have included a brief descriptive analysis of the economic growth, as well as of the tax revenues registered by these eight countries analyzed. Thus, the graphical analysis is divided and analyzed into two parts, as follows.

The evolution of economic development in flat tax countries

In figure 1 below is presented the evolution of the economic development expressed in annual growth rates of GDP per capita for each flat taxation country.

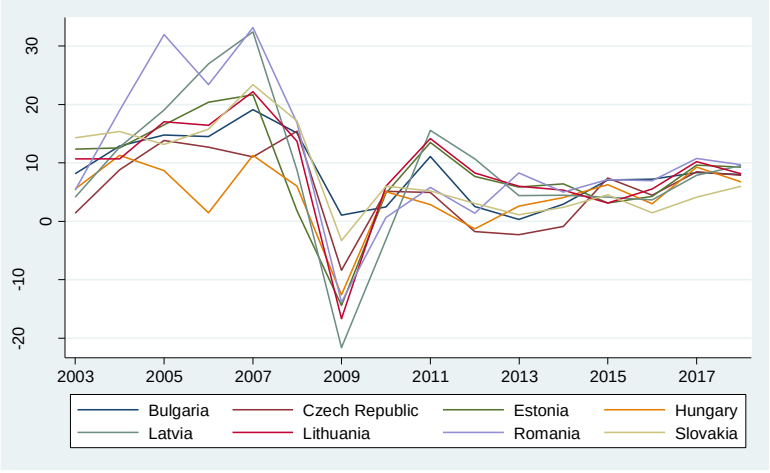

Figure 1: The evolution of GDP per capita in flat taxation countries (2013-2018)
Own processing based on data provided by Eurostat

The evolution of GDP is similar in these countries, recording decreases during the last financial crisis started in 2008 and stabilizing at very close levels after 2013. These similar evolutions do not necessarily reflect the same degree of economic development as the graph shows year-on-year growth in GDP per capita. However, we note that within these eight countries there are two groups of countries from neighbouring geographical areas, namely the Baltic countries Estonia, Latvia and Lithuania and Central and Eastern European countries Bulgaria, Czech Republic, Romania and Slovakia. Thus, we can affirm at the same time that even the degree of economic development is similar.

The evolution of taxation elements in flat tax countries

In the following figures are presented the evolutions of CIT, PIT, VAT and SSC (for employees and for companies) for these eight countries.

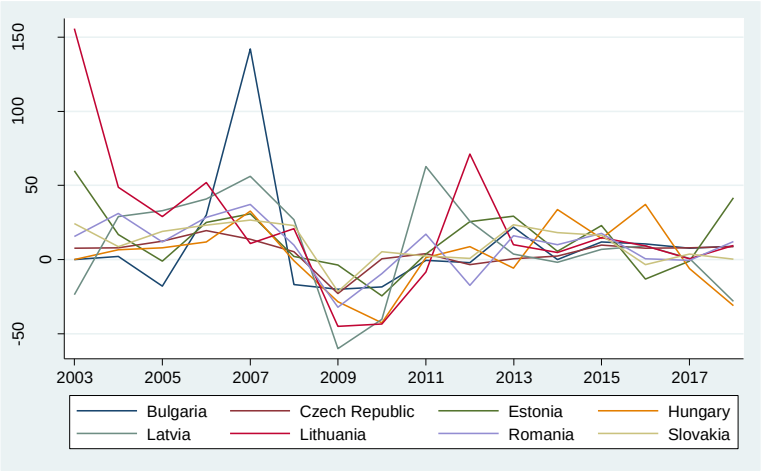

Figure 2: The evolution of corporate income tax in flat taxation countries (2003-2018)

Own processing based on data provided by Eurostat

Bulgaria had a sharp increase in revenues in 2007 when the CIT rate was reduced to 10%, which can be considered unusual because in this country the tax rate decrease (to the minimum existing at EU level) meant a very big increase in CIT revenues. This can also denote a high level of tax evasion before this change. Nevertheless, it seems that the main principle stated by the Laffer Curve is applied in the case of Bulgaria, namely the revenues increase when the taxes are lowered. The financial crisis started in 2008 had a negative impact of CIT for all countries. However, the effect of this crisis on CIT was not as strong as in the case of other taxes (as we will see in the following). Sharp increases were registered in the cases of two Baltic countries, Latvia in 2011 and Lithuania in 2012, with the net period bringing a stabilization of growth in all countries.

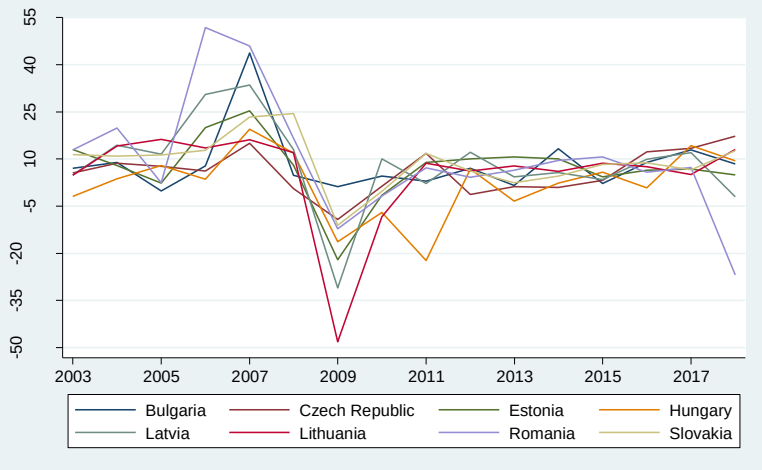

Figure 3: The evolution of personal income tax in flat taxation countries (2003-2018)

Own processing based on data provided by Eurostat

In the case of the element that plays the most important role in our analysis, we observe in the flat tax countries a similar trend to a large extent. In the case of Romania, we recognize a significant decrease in 2005 when Romania switched from progressive taxation to flat taxation followed in 2006 by a sharp increase. However, the effects of the financial crisis drastically affected this growth.

We observe a brutal impact of the financial crisis on the PIT revenues, Lithuania experiencing the strongest effects of this crisis in 2009 when recorded the sharpest decline in terms of PIT revenues within the flat tax countries. As in the case of the other elements studied, the post-crisis period meant a stabilization in terms of revenues collected also in the case of PIT. Nevertheless, in the specific case of Romania, the decrease of the flat rate from 16% to 10% in 2018 had an immediate effect on the PIT in the sense that the revenues fell heavily in 2018.

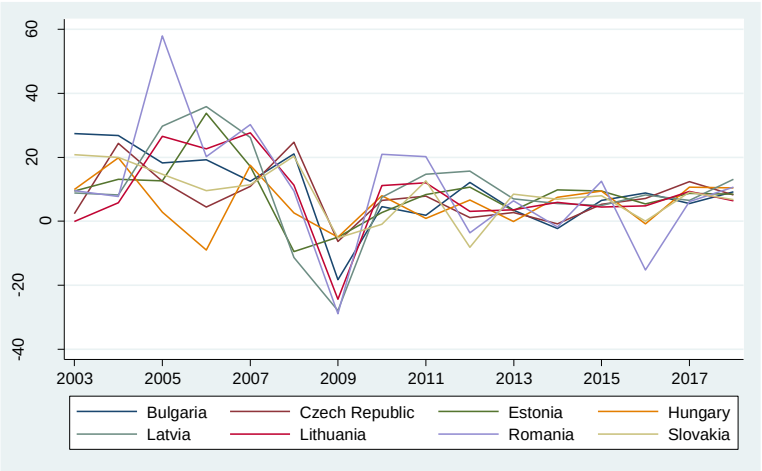

Figure 4: The evolution of VAT in flat taxation countries (2003-2018)
Own processing based on data provided by Eurostat

In the case of VAT, we observe different evolutions until 2008. We can account these evolutions for the various legislative changes and as a result of the implementation of the European VAT Directive. For example, we observe in the case of Romania a sharp increase in 2004-2005, the period in which a specific legislation (a new Tax Code) was introduced, including VAT.

The financial crisis also marked for the VAT revenues massive decreases. Followed by a stabilization period in the following years. In addition, the various deviations from the trend (with an emphasis on Romania) were mainly due to increases or decreases in the VAT rate.

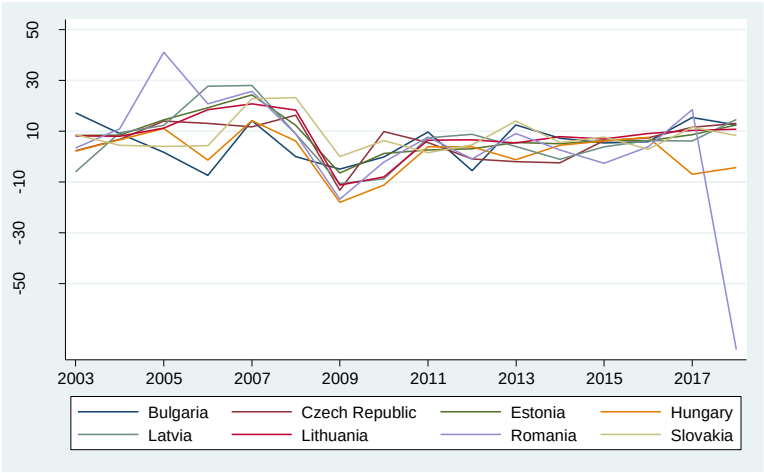

Figure 5: The evolution of social security contributions for employers in flat taxation countries (2003-2018)
Own processing based on data provided by Eurostat

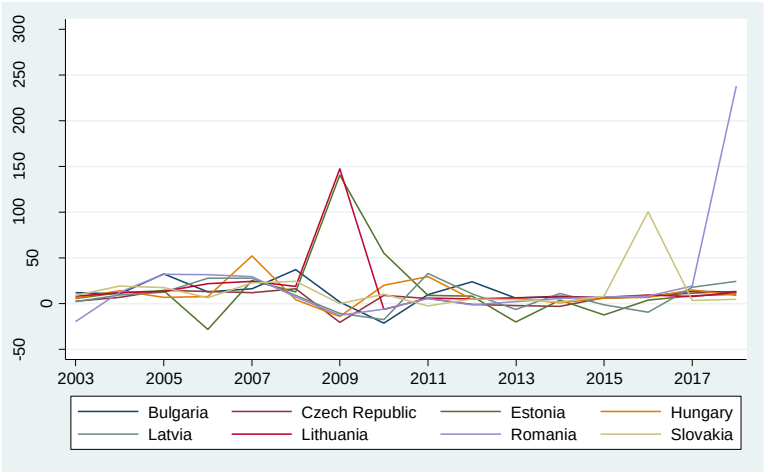

Figure 6: The evolution of social security contributions for employees in flat taxation countries (2003-2018)
Own processing based on data provided by Eurostat

Regarding the SSC, the trends are very similar for both types of SSC, and the effects of the financial crisis were very low. The main deviations from the trend were registered in Romania in 2018, when the burden of SSC was shifted from the employers to employees. Also, in 2009 Estonia and Lithuania registered sharp increases in SSC for employees as a result of increasing the SSC rates.

As a conclusion of the graphical analyzes, we notice that the economy responds immediately to the impulses given by the taxation, considering that the deviations from the trend are caused by various changes in the level of taxation (increases or decreases in tax rates, change of fiscal policy etc.) At the same time, the last financial crisis has left its mark on all the studied elements, with a reduced effect in the case of SSC.

4. Econometric results

As mentioned above, in our research we proceeded to carry out econometric analyzes by using econometric models with panel data and through Stata software. Thus, we will present the econometric analyses and the results obtained. Even though the subject of this paper is focused on the taxation of individuals, in such an analysis, in order to correlate the econometric dimension with the economic one, we cannot reject the inclusion of the main elements that are part of the tax system. Thus, in addition to the main elements directly related to the taxation of individuals (PIT and SSC), we included the other main tax elements CIT and VAT.

✓ *The methodology used*

In our analysis, we started from the equation of the following model:

$$GDPpc\_p_{it} = \beta_0 + \beta_1 \times CIT\_p_{it} + \beta_2 \times PIT\_p_{it} + \beta_3 \times VAT\_p_{it} + \beta_4 \times SSC\_comp\_p_{it} + \beta_5 \times SSC\_emp\_p_{it} \quad (1)$$

where:

- GDPpc_p = the Gross domestic product per capita expressed as growth percentages from previous year;
- CIT_p = the Corporate income tax expressed as growth percentages year by year;
- PIT_p = the Personal income tax expressed as growth percentages year by year;
- VAT_p = the Value added tax expressed as growth percentages year by year;
- SSC_comp_p = the Social security contributions registered from companies expressed as growth percentages year by year;
- SSC_emp_p = the Social security contributions registered from employees expressed as growth percentages year by year;
- β0 = the constant;
- β1 – β5 = the coefficients for each independent variable;
- u = the error term;
- i = the country;
- t = the time (year).

The countries subject to the econometric analysis were Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania and Slovakia and the period analyzed was 2003-2018.

✓ *The fixed effect model*

In order to decide on the types of regression that could be applied, we started from the analysis of certain tests that showed us that the individual effects are not negligible. Thus, we decided to use the panel regression model with fixed effects (“FE model”). In this regard, using the xtreg function from Stata, we obtained the following results.

```
. xtreg GDPpc_p CIT_p PIT_p VAT_p SSC_emp_p SSC_comp_p, fe

Fixed-effects (within) regression               Number of obs      =       128
Group variable: Ctry                            Number of groups   =         8

R-sq:                                           Obs per group:
     within  = 0.7943                                         min =        16
     between = 0.8823                                         avg =      16.0
     overall = 0.7965                                         max =        16

                                                F(5,115)           =     88.80
corr(u_i, Xb)  = 0.0939                         Prob > F           =    0.0000
```

GDPpc_p	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
CIT_p	.0313778	.0157281	2.00	0.048	.0002235	.0625322
PIT_p	.2583393	.0447294	5.78	0.000	.169739	.3469396
VAT_p	.3421669	.0376827	9.08	0.000	.2675247	.4168092
SSC_emp_p	.0518109	.0137335	3.77	0.000	.0246076	.0790143
SSC_comp_p	.1251649	.0437616	2.86	0.005	.0384817	.2118481
_cons	.0136727	.0050388	2.71	0.008	.0036918	.0236537

Figure 7: The first FE model output
Own processing using Stata

From this output we can observe that Prob (F) fulfills the conditions to assert that the model is valid as a whole, namely its value is greater than 0.05 (5%) and all the coefficients in this model are different from zero. This fact is also reinforced by the R-square values (that are over 50%).

Given the fact that the p-value for each independent variable is greater than 0.05 (5%), we can assert that all independent variables have a significant influence on the dependent variable. This significance is also confirmed by the t-values (which are all greater than 1.96).

✓ *The random effects model*

Further, using the same xtreg function, we performed random effect model ("RE model") estimation, and the results are presented in the output below.

```
. xtreg GDPpc_p CIT_p PIT_p VAT_p SSC_emp_p SSC_comp_p, re

Random-effects GLS regression                   Number of obs      =       128
Group variable: Ctry                            Number of groups   =         8

R-sq:                                           Obs per group:
     within  = 0.7941                                         min =        16
     between = 0.8897                                         avg =      16.0
     overall = 0.7967                                         max =        16

                                                Wald chi2(5)       =    478.05
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

GDPpc_p	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
CIT_p	.0325068	.0152134	2.14	0.033	.0026891	.0623245
PIT_p	.2665113	.0426477	6.25	0.000	.1829233	.3500992
VAT_p	.3432522	.037101	9.25	0.000	.2705356	.4159687
SSC_emp_p	.0554192	.0133187	4.16	0.000	.029315	.0815235
SSC_comp_p	.1197757	.0420604	2.85	0.004	.0373388	.2022125
_cons	.0127268	.0049255	2.58	0.010	.0030731	.0223806

Figure 8: The RE model output
Own processing using Stata

We can observe that the results obtained in the RE model are very similar to those in the FE model. The same mentions regarding the statistical values obtained in the FE model are valid here.

✓ *Distinguish between FE model and RE model*

In order to decide between the FE model and RE model we run the Hausman test.

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
CIT_p	.0313778	.0325068	-.001129	.0039908
PIT_p	.2583393	.2665113	-.008172	.0134868
VAT_p	.3421669	.3432522	-.0010853	.006596
SSC_comp_p	.1251649	.1197757	.0053893	.0120829
SSC_emp_p	.0518109	.0554192	-.0036083	.0033496

```
b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

        chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                =        2.31
      Prob>chi2 =      0.8051
```

Figure 9: The output of Hausman test
Own processing using Stata

According to this output, the associated probability of the Hausman test indicates that the use of the RE model would be more appropriate. However, according to Baltagi (2005) [1], the results of this test must be correlated with the economic conditions and with the results of other tests. In this regard, in our analysis we decide to perform the Breusch and Pagan Lagrangian multiplier test for random effects in order to verify the null hypothesis that the RE model is not appropriate.

```
Breusch and Pagan Lagrangian multiplier test for random effects

GDPpc_p[country,t] = Xb + u[country] + e[country,t]

Estimated results:
```

	Var	sd = sqrt(Var)
GDPpc_p	.007409	.0860753
e	.0016027	.040034
u	0	0

```
Test:   Var(u) = 0
                        chibar2(01) =      0.00
                     Prob > chibar2 =    1.0000
```

Figure 10: The output of Breusch and Pagan Lagrangian multiplier test for random effects
Own processing using Stata

Considering that the associated probability of this test is greater than 0.05, we failed to reject the null hypothesis and we can conclude that the RE model is not appropriate. Thus, taking into account this result and the fact that the observations included in the model do not represent a random sample from a pool data, in the following, we focused on the econometric tests on the FE model, in order to establish a reliable model.

✓ *Testing for heteroskedasticity*

Further, we will measure the variance of the residual variable – the heteroskedasticity hypothesis. This must be constant over time at the individual level. For testing this, we used the Modified Wald test for groupwise heteroskedasticity in fixed effect regression model. Such test can be performed in Stata by using the command xttest3. The null hypothesis of this test is that there is homoskedasticity (constant variance).

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (8)  =       23.72
Prob>chi2 =      0.0026
```

Figure 11: The output of the Modified Wald test for groupwise heterokcedasticity in fixed effect regression model
Own processing using Stata

From the output of xttest3 command, we can observe that the associated probability of this test is under 0.05. Therefore, we should reject the null hypothesis according to which the errors are homoskedastic and we conclude the presence of heteroskedasticity.

✓ *Testing for cross-sectional dependence*

By performing the Breusch-Pagan LM test of independence, we tested the null hypothesis according to which the residuals are not correlated. The command used in Stat was xttest2 and its output is presented below:

```
. xttest2

Correlation matrix of residuals:

           __e1     __e2     __e3     __e4     __e5     __e6     __e7     __e8
__e1    1.0000
__e2    0.4996   1.0000
__e3   -0.1082   0.0747   1.0000
__e4    0.3435   0.0662   0.4797   1.0000
__e5    0.0945   0.1230   0.3421  -0.1647   1.0000
__e6   -0.0868  -0.2102   0.4833   0.3355   0.1309   1.0000
__e7   -0.1529  -0.2488  -0.0742  -0.3535   0.3070  -0.4159   1.0000
__e8    0.0073   0.4519   0.1023  -0.2358   0.1616   0.2197  -0.2279   1.0000

Breusch-Pagan LM test of independence: chi2(28) =    33.317, Pr = 0.2243
Based on 16 complete observations over panel units
```

Figure 12: The output of Breusch-Pagan LM test of independence
Own processing using Stata

Given the results of this test, since the probability is of 0.2243, we cannot reject the null hypothesis and we can conclude that there is no cross-sectional dependence.

✓ *Testing for serial correlation*

One test that we performed is related to serial correlation. In this regard, we used the Wooldridge test for autocorrelation in panel data that has as null hypothesis according to which there is no first-order autocorrelation within the data used in the model. We use the command xtserial available in Stata to run this test and the output is presented in figure 13 below.

```
. xtserial GDPpc_p CIT_p PIT_p VAT_p SSC_comp_p SSC_emp_p

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       7) =     11.435
           Prob > F =      0.0117
```

Figure 13: The output of Wooldridge test for autocorrelation in panel data
Own processing using Stata

The associated probability of this test is of 0.0117 (smaller than 0.05) and we can reject the null hypothesis and we can conclude that the data used does have first-order autocorrelation. Such autocorrelation can cause smaller standard errors of the coefficients than they actually are; also, this can cause a higher value of R-squared.

✓ *Testing for data stationarity*

In the beginning of our analysis, we proceeded to test for unit roots/stationary in the panel dataset used. By using the command xtunitroot from Stata, we run the Levin-Lin-Chu unit-root test for all the data included in the models. This test has a null hypothesis according to which panels contain unit roots.

Since the p-values associated with the test is lower than the 5% significance threshold in all the cases, we rejected the null hypothesis, which means that all the variables are stationary. This fact could be caused by the use of data in the form of growth rates (compared to the previous years).

✓ *The final fixed effect model*

Considering the econometric tests results obtained, we estimated the fixed effects model by using the xtscc command, which estimates the regression taking into account the presence of heteroskedasticity, autocorrelation of errors and the possible cross-sectional dependence, leading to results that are more reliable.

The robust estimation is presented in figure 14 below.

```
. xtscc GDPpc_p CIT_p PIT_p VAT_p SSC_comp_p SSC_emp_p, fe

Regression with Driscoll-Kraay standard errors   Number of obs      =       128
Method: Fixed-effects regression                 Number of groups   =         8
Group variable (i): Ctry                         F(  5,     15)     =    779.32
maximum lag: 2                                   Prob > F           =    0.0000
                                                 within R-squared   =    0.7943
```

GDPpc_p	Coef.	Drisc/Kraay Std. Err.	t	P>|t|	[95% Conf.	Interval]
CIT_p	.0313778	.0113187	2.77	0.014	.0072527	.055503
PIT_p	.2583393	.0482998	5.35	0.000	.1553907	.3612879
VAT_p	.3421669	.0295744	11.57	0.000	.2791305	.4052034
SSC_comp_p	.1251649	.0518726	2.41	0.029	.0146012	.2357287
SSC_emp_p	.0518109	.0172303	3.01	0.009	.0150854	.0885365
_cons	.0136727	.0053532	2.55	0.022	.0022627	.0250828

Figure 14: The final FE model output
Own processing using Stata

We notice that the results are similar to some extent with the first models estimated, but within this model, we obtained better p-values (smaller), as well as t-values (greater). Thus, from a statistical point of view, this model is valid and all the independent variables have a significant influence on the dependent variable GDPpc_p. All coefficients obtained are positive, reflecting the direct relationships between the independent variables and the dependent variable. Although the initial testing (Hausman test) indicated that the RE model would be more appropriate, based on additional testing and informational criteria, we decided that the FE model fits better in our case, and the robust results confirm this choice.

All the econometric results obtained were judged and interpreted based on the indication mentioned by Baltagi (2005) [1], Torres-Reyna (2007) [24] and Wooldridge (2010) [27].

Regarding the economic interpretation, the coefficients thus obtained indicate the following:

- CIT impact: At a 1 percentage point increase in CIT revenues, GDP per capita increases by 0.03 percentage points, provided that the other independent variables remain constant. This relatively small percentage compared to the others can be explained by the fact that corporate taxation has a limited effect on the economic growth felt at the individuals' level.
- PIT impact: At a 1 percentage point increase in PIT revenues, GDP per capita increases by 0.25 percentage points, provided that the other independent variables remain constant. Considering that, this element is practically the most important in our analysis, the positive value thus obtained can be interpreted in the sense that when the revenues from PIT are higher, automatically the revenues of the individuals are higher (and implicitly the economic wealth felt at the population level is increased). Thus, we can affirm that these two elements, PIT and GPD per capita are in a positive correlation and have the same evolution. This may also lead us to the thought that PIT is less harmful to economic growth.
- VAT impact: At a 1 percentage point increase in VAT revenues, GDP per capita increases by 0.34 percentage points, provided that the other independent variables remain constant. The high and positive value of this coefficient can be explained from the economic point of view by the fact that the economies of these

countries are consumption-based economies (like most other countries) and we can assume that consumption means economic wealth for the inhabitants of these countries.

- SSC impact:

– SSC registered from companies: At a 1 percentage point increase in SSC revenues from companies, GDP per capita increases by 0.12 percentage points, provided that the other independent variables remain constant. From an economic point of view, the explanation is similar to a certain extent to that related to the impact of PIT. Moreover, corroborating this coefficient with the one for SSC registered from employees, we can assume that since the SSC burden is shifted to companies, the individuals can enjoy higher economic wealth.

– SSC registered from employees: At a 1 percentage point increase in SSC revenues from employees, GDP per capita increases by 0.05 percentage points, provided that the other independent variables remain constant. This coefficient (with a smaller value compared to the others) can be easily explained by the fact that the burden of SSC for employees is less harmful for the economic wealth of citizens.

Corroborating the results obtained by us with those of the mentioned specialized literature, we can observe that the results within this paper largely follow the trend of the results obtained in the recent studies performed on the impact of taxation on economic growth, even if our intention was to analyze strictly the countries that apply a flat taxation in the case of personal income tax. Thus, our study contributes to the specialized literature through a specific analysis and conclusive economic results. Within the obtained results, we could observe that the main element in the models, PIT, has an impact similar to the other fiscal elements included.

5. Conclusions, discussions and limitations

Through this paper, we intended to highlight the impact that the taxation has on the economic growth felt at the population level in the case of EU Member States that apply the flat taxation system for individuals. This tax system can be considered to a certain extent less complicated than the progressive one, since it implies a unique tax rate.

As we presented, following the econometric tests, we have come to a robust econometric model with fixed effects that uses panel data for period 2003-2018 (data according to Eurostat). The model thus obtained presents the positive direct relationship between tax elements and economic growth. Definitely, our analysis also includes certain limitations, of which we can mention the fact that two countries that did not apply a flat taxation during the analyzed period were included in the analysis. Namely, Romania applied the flat taxation starting with 2005 and Slovakia applied this type of taxation until 2013. Keeping these countries in our analysis was decided following the descriptive analysis that showed a similar evolution, and the impact of these changes does not affect the results.

It is obvious that the economic development of a country and the economic well-being of its citizens depend on several factors, but through this paper, we carried out a strict analysis of the fiscal elements, which represent only a part of these factors. Further, the intention is to carry out a comparative analysis of the results obtained in this paper with a future study focused on the countries applying the progressive taxation.

The results obtained within this paper confirmed our initial expectations, as well as the trend of the latest studies according to the specialized literature. Namely, in general, the fiscal elements used have a positive impact on the economic growth felt at the level of citizens (expressed by the growth rate of GDP per capita). Even if the result

according to which PIT has a positive influence on the econometric growth is not in agreement with most studies in the specialized literature, this result is still in agreement with the results obtained by Stoilova & Patonov (2012) [18] and Surugiu & Surugiu (2018) [20]. Furthermore, we can compare our result to the one obtained by Elshani & Ahmeti (2017) [11]. Thus, we can assume that this paper offers a new perspective on the cause analyzed by panel data and by the specificity of the countries analyzed.

References

Baltagi, B.H. (2005). Econometric analysis of panel data. 3rd edition. John Wiley&Sons Ltd.

Bazgan R. M. (2018). The impact of direct and indirect taxes on economic growth: An empirical analysis related to Romania. Proceedings of the 12th International Conference on Business Excellence 2018, 114-127.

Bikas, E.; Subaciene, R; Astrauskaite, I.; Kelioutyte-Staniuleniene, G. (2014). Evalution of the personal income progressive taxation and the size of tax-exempt amount in Lithuania. Ekonomika 93, 84-101.

Bird, R.M.; Zolt, E.M. (2011). Dual Income Taxation: A promising path to tax reform for developing countries. World Development vol. 39 (2011), no. 10, 1691-1703.

Bloom, C. C. (1955). State and Local Tax Differentials and the Location of Manufacturing. Bureau of Business and Economic Research.

Burgess, R.; Stern, N. (1993). Taxation and Development, Journal of Economic Literature, 31(2), 762-830.

Carlton, D. W. (1979). Why new firms locate where they do: An econometric model Interregional Movements and Regional Growth. The Urban Institute.

Dackenhag, M.; Hansson, A. (2012). Taxation of income and economic growth: An empirical analysis of 25 rich OECD countries. Working papers 2012:6. Department of Economics and Management – Lund University.

Dolenc, P; Laporsek, S. (2010). Tax wedge on labour and its effect on employment growth in the European Union. Prague Economic Papers no. 4, 344-358.

Durovic-Todorovic, J.; Milenkovic, I.; Kalas, B. (2019). The relationship between direct taxes and economic growth in OECD countries. Economic Themes (2019) 57(3). 273-286.

Elshani, A.; Ahmeti, S. (2017). The Effect of Progressive Tax on Economic Growth: Empirical Evidence from European OECD Countries. International Journal of Economic Perspectives, 2017, vol. 11, issue 4, 18-25.

Hakim, T. A. (2020). Direct Versus Indirect Taxes: Impact on Economic Growth and Total Tax Revenue. International Journal of Financial Research. Vol. 11, no. 2.

Hall, R.E.; Rabushka, A. (1995). The flat tax. Hoover Institution Press 2nd ed. Stanford.

Helms, L. J. (1985). The Effect of State and Local Taxes on Economic Growth: A Time Series Cross Section Approach, The Review of Economics and Statistics, 67, 574-82;

Paulus, A.; Peichel, A. (2008). Effects of Flat Tax Reforms in Western Europe on Equity and Efficiency. FiFo-CPE Discussion Paper No. 08-4.

Shapiro R.J. (1996). Why Fairness Matters: Progressive Versus Flat Taxes. Taxes & The New Economy. Progressive Policy Institute Washington.

Slemrod J. (1994). On the high-income Laffer curve. Tax Progressivity and Income Inequality. Cambridge University Press.

Stoilova, D.; Patonov, N. (2012). An empirical evidence for the impact of taxation on economy growth in the European Union. Book of Proceedings – Tourism and Management Studies International Conference Algarve 2012(3), 1031-1039.

Surugiu, M.R.; Surugiu, C. (2018). Fiscal variables and economic growth. Measuring the impact for Romania. EuroEconomica – Fiscal Theory and Practice, 1(37)/2018, 7-16.
Surugiu, M.R.; Surugiu, C. (2018). The assessment of taxation impact on economic development. A case study of Romania (1995-2014). EuroEconomica – Business Administration and Business Economics 2(36)/2017, 7-20.
Szarowská, I. (2013), Effects of taxation by economic functions on economic growth in the European Union. Proceedings of the 6th International Scientific Conference: Finance and the performance of Firms in Science, Education and Practice. Tomas Bata University, 746-758.
Thompson, W. R.; Mattila, J. M. (1959). An Econometric Model of Postwar State Industrial Development. Wayne State University Press.
Topal, M. H. (2019). An Analysis of the Relationship between Tax Structure and Gross Domestic Product in European Transition Economies. JETAS – vol. 7-2 (2019).
Torres-Reyna, O. (2007). Panel data analysis. Fixed and random effects using Stata. v. 4.2. Data & Statistical Services. Princeton University.
Vatavu, S.; Lobont, O., R.; Stefea, P.; Brindescu-Olariu, D. (2019). How Taxes Relate to Potential Welfare Gain and Appreciable Economic Growth. Sustainability 2019, 11, 4094.
Widmalm, F. (2001). Tax Structure and Growth: Are Some Taxes Better Than Others? Public Choice 107 (3/4), 199-219.
Wooldridge, J. M. (2010). Econometric analysis of cross section and panel data. 2nd edition. The MIT Press.
http://www.ey.com/gl/en/services/tax/global-tax-guide-archive.
https://ec.europa.eu/eurostat/data/database.
https://taxsummaries.pwc.com/.