

Tax compliance: cointegration analysis in romanian context

~ Ph. D. **Marius Surugiu** (*Institute of National Economy, Bucharest, Romania*)

E-mail: mariussurugiu@yahoo.com

~ Ph. D. **Raluca Mazilescu** (*Institute of National Economy, Bucharest, Romania*)

E-mail: ralucamazilescu@gmail.com

~ Ph. D. **Camelia Surugiu** (*Faculty of Administration and Business, University of Bucharest, Romania*)

E-mail: camelia.surugiu@faa.unibuc.ro

Abstract: *This paper aims to identify the long-run relationships between the quality of the education system, public trust in politicians, wastefulness of government spending and tax compliance in the area of individual income taxation (taxpayer's behaviour). Using data for Romania during 2007-2017 period, the analysis identifies a long-run relationship between the variables.*

Keywords: tax policy; tax behaviour; tax compliance; cointegration; unit root; stationarity; Romania

JEL Classification: H21; H26

1. Introduction

The ability of governments to regulate, implement measures, and reallocate resources depends, to a large extent, on their ability to generate revenue. Tax rates, as well as tax revenues, may influence the level of tax compliance in a country.

Tax compliance refers to the correct calculation, reporting and full and timely payment of taxes by the taxpayer. The analysis of tax compliance highlights the degree to which the taxpayer complies (or not) with tax rules, for example, by declaring income and paying the tax. Tax compliance emphasizes the degree of fulfilment of all tax obligations, as specified by the law. Thus, reference is made to the filing of tax returns in time, the correct mention of income and deductions, and the payment of taxes.

The analysis in this paper is focused on identifying the relationship between individual income tax compliance and other variables (quality of the education system, public trust in politicians, and wastefulness of government spending), in the case of Romania. The next section presents a summary of the relevant findings in the previous research. Section three contains the data and the methodology used. Section four presents the results. The last section concludes.

2. Literature Review

In the literature, various aspects related to tax compliance (taxpayer's behaviour) are analysed. Thus, Kirchler and Wahl (2010) discuss the need to assess the tax compliance, tax avoidance, and tax evasion. The authors provide a standardized inventory to be used in surveys. The study of Tran-Nam, et al. (2000) shows that the costs of tax compliance are significant and regressive. Wu and Teng (2005) point out that the tax burden significantly affects the degree of tax compliance, with non-economic factors being important determinants of tax compliance. The authors underline the negative influence of tax rates on tax compliance.

Bătrâncea, et al. (2012) analyse the most relevant studies on the factors that shape tax compliance, in order to understand how these factors could be used by tax authorities, highlighting the most relevant socio-psychological, political and economic ones. The authors underline that an inefficient fiscal policy, reflected in the waste of public funds and in the low quality of public goods, determine taxpayers to think twice before paying their tax obligations. Baum, et al. (2017) highlight the effects of corruption on the state's ability to generate revenue. The corruption is negatively associated with the level of tax revenues and its components. Developing the relationship between the tax administration and the taxpayer improves the tax compliance, by reducing the perception of corruption, thus stimulating the revenues.

The study from the European Commission (2013) assesses and compares various methodologies used to measure the costs of tax compliance, defined as the costs incurred by businesses and individuals to comply with tax regulations, excluding the costs represented by the taxes. The study emphasized that the costs of tax compliance are a growing concern for the taxpayers, who bear them, but also for tax administrations, who want to increase the efficiency of tax systems.

Castro and Scartascini (2015) developed an analysis of taxpayer's compliance and beliefs related to the payment of property tax, compliance levels, and reciprocity. The paper empirically

explores the situation in which the provision of information to taxpayers influences or not their decision to comply. The information is related to the level of reciprocity, compliance of other taxpayers, and taxes. Evidence is provided on the relative importance of these policy tools.

Doerrenberg (2015) analyses the situation in which the use of tax revenues influences compliance behaviour. Tax compliance depends on the use of tax revenue and it is higher when tax revenue is spent on research activities and charitable activities. Gangl, et al. (2014) analyse the tax compliance, focusing on newly created firms. The effect of the tax authority's supervision on timely tax payments is examined. The results show a negative effect of supervision on tax compliance. Kosonen and Ropponen (2015) study the unintentional mistakes of firms in filing tax returns and the extent to which this can be influenced by providing information about the tax code. The results indicate that companies make unintentional mistakes in tax returns and that information about tax rules significantly reduces these mistakes. Weber et al (2014) discuss the behavioural economics literature in the field of taxation and provide information about behavioural economic policy regarding tax compliance (of individuals). The authors emphasized that tax compliance has a direct impact on a country's ability to provide public goods.

Brezeanu et al (2018) analysed the influencing factors of taxpayer's behaviour. The paper contains an econometric model assessing the impact of variables such as poverty, labour productivity, population confidence in state authorities, gross domestic product per capita on tax behaviour, which was estimated using as a proxy the tax rate. The results underlined that there is a negative correlation between taxpayer's behaviour, namely tax compliance, and financial capacity, labour productivity and taxpayer's confidence in state authorities. There is also a positive correlation between tax compliance and GDP per capita.

The analysis of the literature provided an image of the researchers' concerns in identifying the impact of socio-economic and political variables on tax compliance. In the following sections, the relationship between the quality of the education system, public trust in politicians, wastefulness of government spending, and tax compliance in the area of individual income taxation (taxpayer's behaviour) is assessed.

3. Research Methodology

An annual dataset for 2007 – 2017 period was developed for Romania. The variables used in analysis are presented in the following table.

Table 1. The variables used in analysis

Acronym	Explanation	Unit	Source
TAXCI	Tax compliance (the taxpayer's behaviour)	Index	National Institute of Statistics
QEDS	Quality of the education system		World Bank
TRUST	Public trust in politicians		
WGOVS	Wastefulness of government spending		

Source: developed by authors.

Note: TAXCI is computed as a ratio between tax on individual income and GDP.

The descriptive statistics are presented in the following table. This table is presenting important information (mean, median, standard deviation, skewness, kurtosis) regarding the data series.

Table 2. Descriptive statistics

	TAXCI	QEDS	TRUST	WGOVS
Mean	0.035	3.420	1.947	2.503
Median	0.035	3.370	1.959	2.500
Maximum	0.037	3.904	2.317	2.752
Minimum	0.032	2.798	1.745	2.156
Std. Dev.	0.001	0.331	0.180	0.157
Skewness	-0.052	-0.203	0.692	-0.639
Kurtosis	2.881	2.375	2.684	3.602
Jarque-Bera	0.012	0.255	0.923	0.915
Probability	0.994	0.880	0.630	0.633
Sum	0.382	37.621	21.421	27.53
Sum Sq. Dev.	1.44E-05	1.098	0.324	0.247

Source: developed by authors.

In the analysis, it is important first to establish the nature of the time series, and thus to verify the data stationarity. The test used is the unit root, by successively applying the Augmented Dickey – Fuller (ADF), Elliott-Rothenberg-Stock DF-GLS, and Philips-Perron (PP) methods. Economic variables are often non-stationary and it is preferable to apply some tests to verify this feature. If the data series are non-stationary, with the same order of integration, then a long-run relationship between the variables may exist, provided that they are cointegrated. Cointegration tests are applied to avoid false results. A linear combination of two or more non-stationary series can be stationary (Engle and Granger, 1987).

To test for cointegration, the Engle-Granger method is used. The Engle-Granger residual-based test (unit root test) is applied to the residuals. The test has the method of accounting for serial correlation in the residual series - the parametric, Augmented Dickey-Fuller (ADF) approach.

4.Results and Discussion

To test the presence of a unit root (to analyse the non-stationarity of the data series), ADF, ERS DF-GLS and PP tests are applied. All three unit root tests indicate that the selected variables, TAXCI, QEDS, TRUST, and WGOVS respectively, are non-stationary and integrated of the order one I(1). The results of the tests for non-stationarity of the variables, in levels and in differences, are reported in the following table.

Table 3. Tests for non-stationarity on selected variables (unit root test)

Variables	Augmented Dickey-Fuller (ADF)	Elliott-Rothenberg-Stock DF-GLS test statistic	Phillips-Perron test statistic
Level			
TAXCI	-2.519	-2.367*	-2.540
QEDS	-1.537	-2.245	-0.789
TRUST	-2.070	-2.168	-1.923
WGOVS	-2.152	-2.310*	-2.174
1st diff.			
Δ TAXCI	-3.882*	-4.395**	-4.037*
Δ QEDS	-3.482*	-3.036*	-1.884
Δ TRUST	-3.230	-3.502*	-4.187*
Δ WGOVS	-5.394**	-5.936**	-5.936**

Source: developed by authors.

Note: $p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***.

In the following, the Engle-Granger cointegration test was applied, to identify the existence of long-run relationships between variables. The Engle-Granger residual-based tests are unit root tests applied to the residuals obtained from a static (S) OLS cointegrating regression.

Regarding the test results, the normalized autocorrelation coefficient (z-statistic) for residuals are computed. The results for the z-statistics are mixed, with the residuals from the WGOVS equation which are unable to reject the null hypothesis. On balance, however, the test statistics suggest that we can reject the null hypothesis of no cointegration.

Table 4. Single-equation cointegration test - Engle-Granger cointegration test

Series: TAXCI QEDS TRUST WGOVS		
Sample: 2007 2017		
Null hypothesis: Series are not cointegrated		
Cointegrating equation deterministics: C		
Automatic lags specification based on Schwarz criterion (maxlag=1)		
Dependent	z-statistic	Prob.*
TAXCI	-19.892	0.000
QEDS	-99.473	0.000
TRUST	-44.134	0.000
WGOVS	-8.903	0.611

Source: developed by authors.

Note: $p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***.

The unit root test and the Engle-Granger cointegration test indicated that the data series are non-stationary and cointegrated. In conclusion, we can say that there is a long-run equilibrium relationship between the analysed variables.

5. Conclusions

The paper finds evidence that there is a long-run relationship between the quality of the education system, public trust in politicians, wastefulness of government spending and tax compliance in the area of individual income taxation (taxpayer's behaviour).

If taxpayers have a higher level of education, then there are good chances that they will acquire the ability to understand the necessity to pay taxes and the impact of their action on the decision maker's capacity to collect revenues, used for financing socio-economic measures for the whole society. At the same time, education may lead to a boost in tax compliance, as it contributes to an increase in taxpayers' willingness to comply.

Confidence in politicians can strongly influence the taxpayer's behaviour. If there is a high perception of corruption in society, the taxpayers will attempt not to declare an important part of their revenues, in order to pay fewer taxes. On the contrary, if individuals believe in decision-makers' honesty to act in the interest of citizens and to elaborate fair measures and procedures, they will more likely cooperate, by declaring all their revenues and paying due taxes. In this context, improving the relationship of trust between taxpayers and politicians may play an important role in ensuring increased voluntary tax compliance.

Another important aspect of tax compliance is related to the capacity of the government to use the revenue from taxes in the best way possible. Individuals will pay their tax obligations if they are convinced that the decision-makers are using these funds to provide adequate public goods.

Future research may consider to extend the time period of analysis and to develop a vector error correction model (VECM) and the impulse response function, explaining the impact produced by a shock in independent variables on tax compliance. Future research may also develop an analysis with a panel dataset for EU countries, tax compliance depending on various factors influencing the socio-economic environment.

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