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Analysis of the Tax Compliance in the EU: VECM and SEM

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Abstract: Tax compliance is an important indicator for the proper functioning of the tax authority, influencing the budget revenue level. In this study, a Vector Error Correction Model (VECM) analysis was developed to identify the long-term relationships between the compliance in individual income taxation (taxpayer's behavior), public trust in politicians (trust in authorities), and rule of law (power of the authorities), using unbalanced panel data for the European Union (EU28) during the 2007–2017 period. The results underline the causality of the long-run relationships between the variables. The results of the VECM analysis underline the need for various support measures for voluntary tax compliance, with the trust variable having an important impact on tax compliance. In addition, a Structural Equation Modeling (SEM) analysis was employed using an improved data set with variables such as the compliance in corporation taxation (taxpayer's behavior), wastefulness of government spending, and quality of the education system. The results of the SEM analysis underline the positive and significant influences of the variables on tax compliance.

Keywords: tax policy; tax behavior; tax compliance; cointegration; unit root; stationarity; EU28

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1. Introduction

Taxpayers and governments generally have different targets in the area of taxation. On the one hand, taxpayers want to pay as little tax as possible, but governments have a growing need for financial resources. For taxpayers, taxes represent a burden. Governments should attempt to motivate taxpayers to comply with tax law, using their power and by creating a trusting relationship with them.

The power of and trust in the authorities may represent factors related to the tax compliance level (taxpayer's behavior). The power of and trust in the authorities are important variables, according to the "slippery slope" framework [1], a concept related to the economic and psychological factors of tax compliance. When discussing the trust in and power of the authorities, previous research based on surveys has focused on aspects such as social norms, justice perceptions, audit probability, and fines. Tax compliance may be stimulated by the deterrence of tax evasion (audits and fines, meaning the authorities' power perception) and by developing a trusting relationship with taxpayers (services and support). The main idea underlined by this framework is related to the relationship between taxpayers and authorities. The "slippery slope" framework is the main motivation for this paper.

Stimulating tax compliance is important for increasing the level of budget revenues. These revenues are further used in public programs, to increase the overall efficiency of the allocation of the resources, and to increase equity and improve resource distribution [2].

Tax compliance underlines the timely reporting and payment of taxes. This indicator emphasizes the fulfilment of tax obligations as specified by the law. This paper examines the long-term relationship between the tax compliance of individuals (taxci), trust in the authorities (trust) and the power of the authorities (power) for the European Union (EU28) case between 2007 and 2017. The data set is represented by an unbalanced panel, and the results of the analysis highlight the causal relationship between tax compliance and trust in the authorities. In addition, a Structural Equation Modeling (SEM) analysis was developed, showing the positive and significant influences of the variables on tax compliance.

Unlike other research that has studied the impact of trust and power on tax compliance with data obtained from surveys applied to taxpayers, this paper uses data from the World Bank and Eurostat and employs a Vector Error Correction Model (VECM) analysis of tax compliance, trust, and power variables in a framework for EU countries.

In this paper, variables such as public trust in politicians and rule of law are used in connection with tax compliance. In addition, variables such as wastefulness of government spending and the quality of the education system are used.

The paper is structured as follows. The next section presents the relevant literature in the field. Section 3 contains the materials and methods employed in the paper. Section 4 focuses on the VECM analysis. Section 5 contains the SEM analysis. Section 7 concludes the paper.

2. Literature Review

In the literature, important studies have analyzed tax compliance. Various indicators have been considered in connection with tax compliance.

The effect of power and trust on tax compliance is important and a positive and significant effect may appear [3]. The "slippery slope" occurs when the power/trust is reduced, leading to a negative effect on tax compliance [4]. Using the power of tax authorities (related to tax legislation and to the support from the population regarding information about misconduct) and trust in tax authorities (tax authorities are interested in the common good), tax compliance may be enforced in the first case (when power of tax authorities is used), and voluntary in the second one (when trust in tax authorities is used) [1,5–8]. There are situations when trust is positively related to voluntary tax compliance [9–11], and power is marginally significant, but both variables do not have an influence on the enforced tax compliance [9]. In addition, there are situations when trust and power have a minimal effect on enforced compliance, but the positive synergistic climate has a strong effect on voluntary compliance [12]. A confidence-based interaction climate is maintained with low coercive power and high legitimate power [13].

2.1. Trust in the Tax Authorities

The relationship between tax authorities and taxpayers has a significant effect on tax behavior [8]. The trust variable is positively associated with tax compliance [14–16] and has an important impact [7,17–23]. Participation in tax non-compliance increases when trust is low [24]. Trust in the government has an important impact on tax system fairness and compliance decisions [25]. Trust in the tax authority reduces the influence of tax audits toward voluntary tax compliance [26]. The development of the relationship between tax administrations and taxpayers may improve the tax compliance [27]. Other authors have identified a negative correlation between taxpayer's behavior (tax compliance) and taxpayer's confidence in state authorities [28]. The tax compliance level may be improved by the combination of trust in and power of the authorities [29,30]. The role of the tax authority has a significant impact on the taxpayers' compliance [31].

2.2. Power of the Tax Authorities

The power of the tax authorities is related to tax audit activities and the punishment of tax evaders. The power variable is an important determinant of tax compliance [7,32], but coercive power is negatively related to implicit trust and tax compliance [33]. The power of the authority directly influences the compliance behavior [34].

Enforced tax compliance is related to the perception of audit probability and sanction severity [35]. The audit probability and rule of law have positive effects on tax compliance [32].

The probability of audit has a significant impact on the taxpayers' compliance [31,34,36–42]. There is an important relationship between tax compliance and penalties [36,39–41,43–45].

In the literature, tax compliance analyses have focused on the decision of paying or evading taxes, with an emphasis on various indicators with impacts on tax compliance.

3. Materials and Methods

In this paper, an annual data set for the 2007–2017 period was developed (unbalanced panel) for the EU28 (Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, and the United Kingdom).

The variables used in the VECM analysis included the tax compliance of individuals (taxci), trust in politicians (trust), and the rule of law (power) (see Table 1). EViews was used in Section 4 [46].

Table 1. The variables used in the VECM analysis.

Acronym	Explanation	Unit	Source
taxci	tax compliance (taxpayer's behavior)	% of GDP	Eurostat
trust	public trust in politicians	index	World Bank
power	rule of law		

Source: developed by the authors.

The tax compliance of individuals (taxci) is the ratio between taxes on individual or household income and GDP, while trust measures the effectiveness of the government and describes how issues such as the quality of public services, the quality of policy development and implementation, and the government's commitment to such policies are perceived. Trust was used to rate the ethical standards of politicians, where 1 = extremely low and 7 = extremely high. Power underlines the extent to which agents abide by the rules of society, and in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

The trust and power variables were sourced from the World Bank. These variables may underline the influence of the trust in and power of the authorities regarding tax compliance for the EU28 case. In this paper, the integration properties were analyzed. In addition, the Granger causality was analyzed through the vector error correction model (VECM). Moreover, the equations of the VECM were analyzed, as well as the impact of shocks on the endogenous variables through the impulse response of the output to Cholesky one standard deviation exogenous variable innovation.

The analysis of the long-run relationship between the taxci, power and trust for EU countries involves several steps. The VECM emphasizes the dynamics of variables and shows how they return to equilibrium after a shock.

As a complementary analysis to the VECM, a special section is dedicated to the SEM analysis, a multivariate statistical analysis technique used to analyze structural relationships, representing a combination of factor analysis and multiple regression analysis. For this analysis, the data set was improved with the following variables: the tax compliance of companies (taxcc), wastefulness of government spending (waste) and quality of the education system (qedu) (see Table 2). R software was used in Section 5 [47].

The tax compliance of companies (taxcc) is the ratio between taxes on the income or profits of corporations and GDP, while waste is a measure of how efficiently the government spends public revenue, where 1 = extremely inefficient and 7 = extremely efficient in providing goods and services. Moreover, qedu is a measure of how well the education system meets the needs of a competitive economy, where 1 = not well at all and 7 = extremely well.

Table 2. The variables added to the data set for the SEM analysis.

Acronym	Explanation	Unit	Source
taxcc	tax compliance (taxpayer's behavior)	% of GDP	Eurostat
waste	wastefulness of government spending	index	World Bank
qedu	quality of the education system		

Source: developed by the authors.

4. Results and Discussion on the VECM Analysis

The VECM analysis was focused on the relationship between the taxci and trust/power variables. The steps of the analysis are (1) the test for the panel unit root, (2) the cointegration test, (3) the development of the panel VECM model, (4) the VEC Granger Causality/Block Exogeneity Wald Tests, and (5) the impulse function.

4.1. Panel Unit Root (PUR) Tests

Before conducting cointegration tests, all variables should have the same properties, meaning that they should be integrated of the same order. The tests for the non-stationarity of the variables, in levels and in differences, indicated that the series are stationary in the first difference and integrated of order one, I(1) (see Table 3). In the following section, the cointegration analysis is developed (see Table 4).

Table 3. PUR test statistics.

Variables	Levin, Lin, and Chu	ADF (ADF—Fisher Chi-Square; ADF—Choi Z-Stat)	PP (PP—Fisher Chi-Square; PP—Choi Z-Stat)
Level			
taxci	0.843	27.015 2.454	29.603 3.062
trust	−0.469	38.280 1.411	45.917 1.370
power	−0.554	51.198 0.580	72.838 0.669
First difference			
Δ(taxci)	−15.407 ***	252.135 *** −12.195 ***	253.405 *** −12.248 ***
Δ(trust)	−11.782 ***	193.616 *** −9.457 ***	198.067 *** −9.552 ***
Δ(power)	−16.189 ***	287.297 *** −12.645 ***	297.431 *** −12.966 ***

Source: developed by the authors. Note: *** p-value $\leq$ 0.001.

Table 4. Cointegration tests.

	Pedroni Residual Cointegration Test			Kao Residual Cointegration Test
	Cross-Sections Included: 25 (3 Dropped)			
	Trend assumption: no deterministic trend	Trend assumption: deterministic intercept and trend	Trend assumption: no deterministic intercept or trend	Trend assumption: no deterministic trend
	Automatic lag length selection based on SIC with a max lag of 1	Automatic lag length selection based on SIC with a max lag of 0	Automatic lag length selection based on SIC with a max lag of 1	Automatic lag length selection based on SIC with a max lag of 1

Table 4. *Cont.*

Pedroni Residual Cointegration Test							**Kao Residual Cointegration Test**	
Cross-Sections Included: 25 (3 Dropped)								
	Alternative hypothesis: common AR coefs. (within-dimension)							
	Statistic	Weighted Statistic	Statistic	Weighted Statistic	Statistic	Weighted Statistic		*t*-Statistic
Panel v-Statistic	0.968	−1.458	−1.872	−3.440	−1.316	−2.955	ADF	−2.825 **
Panel rho-Statistic	−0.573	1.415	2.177	3.529	0.459	1.189	Residual variance	0.267
Panel PP-Statistic	−9.506 ***	−4.365 ***	−8.893 ***	−5.757 ***	−2.690 **	−1.352	HAC variance	0.189
Panel ADF-Statistic	−9.944 ***	−5.076 ***	−7.786 ***	−4.402 ***	−4.657 ***	−2.998 **		
	Alternative hypothesis: individual AR coefs. (between-dimension)							
	Statistic							
Group rho-Statistic	3.124		5.180		2.507			
Group PP-Statistic	−6.366 ***		−8.675 ***		−4.949 ***			
Group ADF-Statistic	−7.101 ***		−4.775 ***		−7.502 ***			

Source: developed by the authors. Note: Series: taxci, trust, and power, sample: 2007–2017, 308 included observations, null hypothesis: no cointegration; Newey-West automatic bandwidth selection, and Bartlett kernel. ** p-value ≤ 0.01, *** p-value ≤ 0.001.

4.2. Cointegration Tests

The cointegration criteria were analyzed with the Pedroni Residual Cointegration Test [48,49], and Kao Residual Cointegration Test [50] when checking the variables' relationships. The conclusion underlines the long-run equilibrium. The analysis was developed by using the Panel VECM, to check the variables' interactions.

According to the Pedroni Residual Cointegration Test, the majority of the results rejected the null hypothesis and accepted the alternative hypothesis, meaning that the variables were cointegrated, with long-term relationships. According to the Kao Residual Cointegration Test, the null hypothesis was rejected and the alternative hypothesis was accepted, meaning that the variables were cointegrated, with long-run relationships. Since the unit root and cointegration tests indicated that the analyzed variables had a unit root I(1) and the non-stationary series were cointegrated, a VECM was displayed.

4.3. Panel VECM Model

The unit root was confirmed by the PUR test and cointegration tests. Cointegration is a feature of the non-stationary series. In the following, a VECM is developed to analyze the nature of the non-stationarity of the variables. An error-correcting model allows the long-run components of variables to obey equilibrium constraints [51]. The VECM underlines the speed of return to equilibrium after a shock, and the equation is written as follows (R-squared = 0.09):

$$\Delta \mathrm{taxci_t} = \Phi_1 \times (\mathrm{taxci_{t-1}} - 56.846 \times \mathrm{trust_{t-1}} + 99.436 \times \mathrm{power_{t-1}} + 65.816) + \Phi_2 \times \Delta \mathrm{taxci_{t-1}} + \Phi_3 \times \Delta \mathrm{taxci_{t-2}} + \Phi_4 \times \Delta \mathrm{trust_{t-1}} + \Phi_5 \times \Delta \mathrm{trust_{t-2}} + \Phi_6 \times \Delta \mathrm{power_{t-1}} + \Phi_7 \times \Delta \mathrm{power_{t-2}} + \varepsilon_t \quad (1)$$

and

$$\Delta \text{taxci}_t = -0.001 \times (\text{taxci}_{t-1} - 56.846 \times \text{trust}_{t-1} + 99.436 \times \text{power}_{t-1} + 65.816) - 0.109 \times \Delta \text{taxci}_{t-1} - 0.081 \times \Delta \text{taxci}_{t-2} - 0.464 \times \Delta \text{trust}_{t-1} + 0.014 \times \Delta \text{trust}_{t-2} + 0.256 \times \Delta \text{power}_{t-1} - 0.788 \times \Delta \text{power}_{t-2} + 0.062 \quad (2)$$

Based on the results, the variables were characterized by causality in the long-run equilibrium (from the independent variables to the dependent variable). To obtain the long-term equilibrium, the speed of adjustment is represented by the value of Φ_1 (in %, annually) for the whole system.

The coefficients of the independent variables (Φ_2 to Φ_7) showed the positive or negative impact on the dependent variable, considering a one percent change in each independent variable. On average, this impact was considered ceteris paribus in the short run.

As cointegrating relationships existed, the Granger causality/block exogeneity Wald test was employed to analyze the causality between the selected variables. In addition, the weak exogeneity was tested through Wald tests in the error correction model (ECM).

4.4. VEC Granger Causality/Block Exogeneity Wald Tests

As cointegrating relationships existed in the model, the VEC Granger Causality/Block Exogeneity Wald Tests were employed to analyze the causality between the selected variables (see Table 5). In addition, the weak exogeneity was tested through Wald tests in the error correction model (ECM). The null hypothesis was rejected, and the trust variable Granger caused taxci (dependent) variable.

Table 5. VEC Granger causality/block exogeneity Wald tests. The sample is for the 2007–2017 period, with 175 included observations, and Δ(taxci) is the dependent variable.

Excluded	Chi-sq	df
Δ(trust)	9.539 **	2
Δ(power)	2.062	2
All	13.710 **	4

Source: developed by the authors. Note: ** p-value ≤ 0.01.

4.5. Impulse Response Function

The impulse response function explains the impact produced by a shock in the trust and power on the taxci over a period of 10 years, as plotted in Figure 1. The effect of a positive shock in trust is presented, with a negative effect for the first 5 years and a positive effect starting with sixth year. The accumulated response indicates a negative effect until the fifth year, with a change in the sixth year, when the effects are still negative. However, the trend shows that after the 10th year, the effects might be positive.

A positive shock in power is plotted, which has a positive effect for the first two years, and a negative effect in the following years. As for the accumulated response, a shock in power shows a negative response for the whole period.

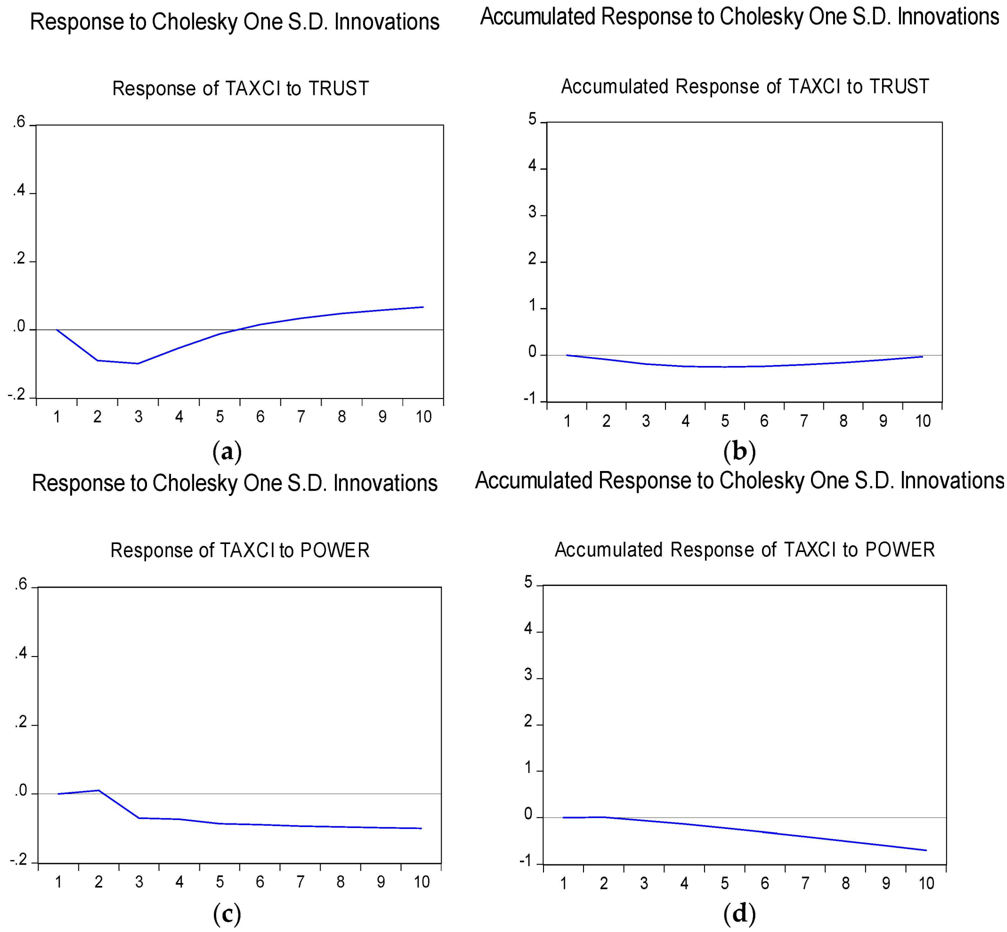

Figure 1. Impulse response functions of the taxci (tax compliance). (**a**) response of taxci to trust (public trust in politicians); (**b**) accumulated response of taxci to trust; (**c**) response of taxci to power (rule of law); (**d**) accumulated response of taxci to power. Source: developed by the authors.

5. Results and Discussion of the SEM Analysis

SEM involves the development of a model, in which different aspects of a phenomenon are presented as a structure, particularly a system of equations, with relationships between variables. In this section, the other three variables are introduced in the analysis, and the effects of the power, trust, qedu, and waste on tax compliance are studied. The discussion explores the structural relationships between the observed variables. The most essential component of a structural equation model is the covariance or statistical relationship between variables (see Table 6).

Table 6. The statistical relationship between variables.

	Taxci	Taxcc	Qedu	Waste	Trust	Power
taxci	27.218	1.865	2.502	1.766	3.725	1.846
taxcc	1.865	2.041	0.447	0.343	0.413	0.217
qedu	2.502	0.447	0.726	0.544	0.738	0.428
waste	1.766	0.343	0.544	1.619	0.566	0.386
trust	3.725	0.413	0.738	0.566	2.404	0.606
power	1.846	0.217	0.428	0.386	0.606	0.371

Source: developed by the authors.

The diagonals represent the variances and the off-diagonals represent the covariances. A positive covariance shows that as one variable increases, the other increases, too.

A model with five exogenous variables is developed in this section (see Table 7). There were positive influences on the endogenous variable (taxci), with the exception of waste. In the case of this variable, as well as in the case of the taxcc, the *p* values underlined that the coefficients were not significant.

Table 7. The model with five exogenous variables.

		Estimator		ML
		Optimization method		NLMINB
		Number of model parameters		26
		Number of observations		308
		Model test user model:		
		Test statistic		11.136
		Degrees of freedom		1
		p-value (Chi-square)		0.001
		Parameter estimates:		
		Standard errors		Standard
		Information		Expected
		Information saturated (h1) model		Structured
		Regressions:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~				
trust	0.441	0.198	2.226	0.026
power	2.728	0.752	3.626	0.000
qedu	1.409	0.517	2.725	0.006
waste	−0.244	0.214	−1.141	0.254
taxcc	0.267	0.175	1.529	0.126
		Covariances:		
	Estimate	Std.Err	z-value	P(>∣z∣)
trust ~~				
power	0.585	0.062	9.441	0.000
qedu	0.702	0.082	8.525	0.000
waste	0.513	0.114	4.502	0.000
taxcc	0.303	0.122	2.490	0.013
power ~~				
qedu	0.406	0.036	11.252	0.000
waste	0.362	0.048	7.613	0.000
taxcc	0.139	0.044	3.197	0.001
qedu ~~				
waste	0.484	0.064	7.592	0.000
taxcc	0.343	0.063	5.447	0.000

Table 7. *Cont.*

Estimator				**ML**
Intercepts:				
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	−3.476	1.562	−2.225	0.026
trust	3.017	0.088	34.441	0.000
power	1.140	0.034	33.361	0.000
qedu	4.273	0.047	90.347	0.000
waste	3.066	0.072	42.354	0.000
taxcc	2.433	0.081	29.940	0.000
Variances:				
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	16.890	1.361	12.410	0.000
trust	2.364	0.190	12.426	0.000
power	0.360	0.029	12.485	0.000
qedu	0.689	0.055	12.636	0.000
waste	1.614	0.130	12.410	0.000
taxcc	2.034	0.164	12.410	0.000

Source: developed by the authors.

5.1. Multivariate Regression with Default Covariance

In multivariate or simultaneous linear regression, multiple outcomes $y_1, y_2, \ldots, y_q$ are modeled simultaneously, where q is the number of outcomes. In the analysis, x_1 waste and x_2 trust predicted y_1 taxci, and only x_2 trust predicted y_2 taxcc (see Table 8).

Table 8. Multivariate regression with default covariance.

Estimator				**ML**
Optimization method				NLMINB
Number of model parameters				8
Number of observations				308
Model test user model:				
Test statistic				6.395
Degrees of freedom				1
p-value (Chi-square)				0.011
Parameter estimates:				
Standard errors				Standard
Information				Expected
Information saturated (h1) model				Structured
Regressions:				
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~				
waste	0.506	0.211	2.403	0.016
trust	1.430	0.175	8.160	0.000
taxcc ~				

Table 8. *Cont.*

Estimator				**ML**
trust	0.172	0.052	3.332	0.001
Covariances:				
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~~				
taxcc	1.097	0.370	2.966	0.003
Intercepts				
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	1.021	0.756	1.350	0.177
taxcc	1.915	0.175	10.946	0.000
Variances:				
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	20.858	1.681	12.410	0.000
taxcc	1.963	0.158	12.410	0.000

Source: developed by the authors.

The covariance of the residuals was 1.097 (positive association between the variance of the taxci and taxcc not accounted for by the exogenous variables). The relationship of taxci with waste was 0.506. For every one unit increase in the waste, the taxci increased by 0.506 points controlling for the effects of the trust. The relationship of the taxci with the trust was 1.430. As the trust increased by one unit, the taxci increased by 1.430 points controlling for the effects of the waste. Finally, the relationship of the taxcc with the trust was 0.172, indicating that an increase of one point in the trust resulted in a 0.172 increase in the taxcc.

A second model was developed containing the other two variables (see Table 9). Instead of trust and waste, variables such as the power and qedu are used. In this case, x_1 qedu and x_2 power predicted y_1 taxci, and only x_2 power predicted y_2 taxcc.

Table 9. Multivariate regression with default covariance, second model.

Estimator				**ML**
Optimization method				NLMINB
Number of model parameters				8
Number of observations				308
Model test user model:				
Test statistic				28.206
Degrees of freedom				1
p-value (Chi-square)				0.000
Parameter estimates:				
Standard errors				Standard
Information				Expected
Information saturated (h1) model				Structured
Regressions:				
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~				

Table 9. *Cont.*

Estimator				**ML**
qedu	1.382	0.491	2.815	0.005
power	3.381	0.687	4.922	0.000
taxcc ~				
power	0.584	0.129	4.510	0.000
		Covariances:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~~				
taxcc	0.513	0.330	1.557	0.120
		Intercepts:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	−2.870	1.538	-1.866	0.062
taxcc	1.768	0.167	10.576	0.000
		Variances:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	17.388	1.401	12.410	0.000
taxcc	1.908	0.154	12.410	0.000

Source: developed by the authors.

The covariance of the residuals was 0.513 (positive association between the variance of the taxci and taxcc not accounted for by the exogenous variables). The relationship of the taxci with the qedu was 1.382. For every one unit increase in the qedu, the taxci increased by 1.382 points, controlling for the effects of the power. The relationship of the taxci with the power was 3.381. As the power increased by one unit, the taxci increased by 3.381 points controlling for the effects of the qedu. Finally, the relationship of the taxcc with the power was 0.584, indicating that an increase of one point in the power resulted in a 0.584 increase in the taxcc.

5.2. Fully Saturated Multivariate Regression

In this case, an additional path of the taxcc on waste was added (see Table 10).

Table 10. Fully saturated multivariate regression.

Estimator	**ML**
Optimization method	NLMINB
Number of model parameters	9
Number of observations	308
Model test user model:	
Test statistic	0.000
Degrees of freedom	0
Parameter estimates:	
Standard errors	Standard
Information	Expected
Information saturated (h1) model	Structured

Table 10. *Cont.*

Estimator				**ML**
		Regressions:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~				
waste	0.599	0.214	2.800	0.005
trust	1.408	0.175	8.029	0.000
taxcc ~				
waste	0.165	0.065	2.542	0.011
trust	0.133	0.053	2.496	0.013
		Covariances:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~~				
taxcc	1.075	0.366	2.937	0.003
		Intercepts:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	0.803	0.760	1.056	0.291
taxcc	1.526	0.231	6.606	0.000
		Variances:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	20.846	1.680	12.410	0.000
taxcc	1.923	0.155	12.410	0.000

Source: developed by the authors.

The variable waste had a positive relationship with the taxci. For every one unit increase in the exogenous variable waste, the endogenous variable taxci increased by 0.599. A second model was developed, and an additional path of taxcc on qedu was added (see Table 11).

Table 11. Fully saturated multivariate regression, second model.

Estimator				**ML**
Optimization method				NLMINB
Number of model parameters				9
Number of observations				308
Model test user model:				
Test statistic				0.000
Degrees of freedom				0
Parameter estimates:				
Standard errors				Standard
Information				Expected
Information saturated (h1) model				Structured
		Regressions:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~				

Table 11. *Cont.*

Estimator				**ML**
qedu	1.609	0.493	3.268	0.001
power	3.119	0.689	4.529	0.000
taxcc ~				
qedu	0.847	0.156	5.435	0.000
power	−0.392	0.218	−1.800	0.072
		Covariances:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~~				
taxcc	0.468	0.315	1.488	0.137
		Intercepts:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	−3.544	1.543	−2.297	0.022
taxcc	−0.740	0.488	−1.516	0.130
		Variances:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	17.376	1.400	12.410	0.000
taxcc	1.741	0.140	12.410	0.000

Source: developed by the authors.

The variable qedu had a positive relationship with taxci. For every one unit increase in the exogenous variable qedu, the endogenous variable taxci increased by 1.609.

In the multiple regression models, one endogenous variable is predicted by two or more exogenous variables. In the case of multivariate regression models, multiple exogenous variables can predict multiple endogenous variables. In the next section, a path analysis is developed, allowing the endogenous variables to predict each other.

5.3. Path Analysis

Multivariate regression is an example of path analysis. In this case, exogenous variables predict endogenous variables. The previous multivariate regression was extended. The hypothesis is that the waste and trust predict the taxci, and the trust predicts the taxcc. In addition, the taxci positively predicts the taxcc (see Table 12).

Table 12. Path analysis.

Estimator	**ML**
Optimization method	NLMINB
Number of model parameters	8
Number of observations	308
Model test user model:	
Test statistic	4.260
Degrees of freedom	1
p-value (Chi-square)	0.039
Parameter estimates:	
Standard errors	Standard
Information	Expected

Table 12. *Cont.*

	Estimator			**ML**
	Information saturated (h1) model			Structured
		Regressions:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~				
waste	0.599	0.214	2.800	0.005
trust	1.408	0.175	8.029	0.000
taxcc ~				
trust	0.083	0.057	1.461	0.144
taxci	0.057	0.017	3.368	0.001
		Intercepts:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	0.803	0.760	1.056	0.291
taxcc	1.788	0.176	10.170	0.000
		Variances:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	20.846	1.680	12.410	0.000
taxcc	1.894	0.153	12.410	0.000

Source: developed by the authors.

The variable taxci positively predicted the taxcc below the effects of trust. For every one unit increase in the taxci, the taxcc was predicted to increase by 0.057 points. In this model, the variable taxci accounted for all of the variance in the taxcc.

A second model was developed. In this case, the hypothesis is that the qedu and power predict the taxci, and the power predicts the taxcc. In addition, the taxci can positively predict the taxcc. The variable taxci was added as a predictor (see Table 13).

Table 13. Path analysis, second model.

	Estimator			**ML**
	Optimization method			NLMINB
	Number of model parameters			8
	Number of observations			308
	Model test user model:			
	Test statistic			24.859
	Degrees of freedom			1
	p-value (Chi-square)			0.000
	Parameter estimates:			
	Standard errors			Standard
	Information			Expected
	Information saturated (h1) model			Structured
		Regressions:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci ~				

Table 13. *Cont.*

	Estimator			**ML**
qedu	1.609	0.493	3.268	0.001
power	3.119	0.689	4.529	0.000
taxcc ~				
power	0.366	0.157	2.326	0.020
taxci	0.044	0.018	2.374	0.018
		Intercepts:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	−3.544	1.543	−2.297	0.022
taxcc	1.715	0.167	10.257	0.000
		Variances:		
	Estimate	Std.Err	z-value	P(>∣z∣)
taxci	17.376	1.400	12.410	0.000
taxcc	1.874	0.151	12.410	0.000

Source: developed by the authors.

The variable taxci positively predicted the taxcc below the effects of power. For every one unit increase in the taxci, the taxcc was predicted to increase by 0.044 points.

5.4. Model Fit Statistics

It is important to assess the fit of the model to determine whether improvements are necessary. A statistic used for this purpose is the CFI (Confirmatory Factor Index). Values can range between 0 and 1 (values greater than 0.90 and conservatively, 0.95, indicate good fit). The formula for CFI is:

$$CFI = \frac{\delta(\text{Baseline})–\delta(\text{User})}{\delta(\text{Baseline})} \tag{3}$$

where

$$\delta = \chi^2 - df \tag{4}$$

and df is the degrees of freedom for the model. To calculate the CFI, the values of statistical tests from Table 14 were used.

Table 14. Model fit statistics.

Model Test User Model	
Test statistic	4.260
Degrees of freedom	1
p-value (Chi-square)	0.039
Model test baseline model	
Test statistic	107.459
Degrees of freedom	5
p-value	0.000

Source: developed by the authors.

Then, χ^2(Baseline) = 107.459 and df(Baseline) = 5, and χ^2(User) = 4.26 and df(User) = 1. Therefore, δ(Baseline) = 107.459 − 5 = 102.459 and δ(User) = 4.26 − 1 = 3.26. The following equation was analyzed. The closer the CFI is to 1, the better the fit of the model, with the maximum being 1. A CFI value of 0.95 or higher was accepted as an indicator of good fit.

$$CFI = \frac{102.459 - 3.26}{102.459} = 0.968 \quad (5)$$

For the second model, the fit statistics are presented. The values of the statistical tests from Table 15 were used.

Table 15. Model fit statistics, second model.

Model Test User Model	
Test statistic	24.859
Degrees of freedom	1
p-value (Chi-square)	0.000
Model test baseline model	
Test statistic	187.371
Degrees of freedom	5
p-value	0.000

Source: developed by the authors.

In the second case, χ^2(Baseline) = 187.371 and df(Baseline) = 5, and χ^2(User) = 24.859 and df(User) = 1. Therefore, δ(Baseline)= 187.371 − 5 = 182.371 and δ(User) = 24.859 − 1 = 23.859. The following equation was analyzed:

$$CFI = \frac{182.371 - 23.859}{182.371} = 0.869 \quad (6)$$

For the second model, the value of CFI was lower than the 0.95 level, meaning that the model might need some improvements.

6. Discussion of the Results

In this work, the existence of the slippery slope framework was confirmed, meaning that the trust in and power of the tax authorities explained the tax compliance level. The VECM analysis underlined the causality of the long-run relationships between variables. The SEM analysis showed positive and significant influences on tax compliance from the independent variables. These results are in line with the literature. For example, the positive and important impact on compliance from trust in the authorities has been found in various works [3,7,9–11,14–23]. The trust variable was related to the voluntary compliance behavior, which may be more effective than the enforced compliance behavior. The trust in politicians was an important factor influencing the taxpayer's behavior. The taxpayers will attempt to evade taxes if they perceive the existence of corruption, but when they are convinced that the decision maker is acting in their interest, (using money from taxes to provide public goods), then they will comply with the established rules and regulations. Thus, the decision maker should adopt measures dedicated to improving the relationship of trust with taxpayers (service-oriented interactions, fair treatment for taxpayers, and the punishment of the dishonest taxpayers), to ensure tax compliance, which has an impact on the revenue raised for the budget.

In addition, previous studies have shown that the power of the authorities has a positive and important relationship with compliance [1,31,32,34,36–39,42–45]. The proxy for the power of authorities is an indicator of the rule of law, showing the degree to which taxpayers comply with the rules, with a higher control by law corresponding to higher enforcement of tax policy. Thus, an increase in the power of the authorities may improve the compliance level.

The wastefulness of government spending is another important indicator used in this study, showing how efficiently the government spends public revenue. The perception of government spending has been analyzed in the literature, showing a positive and important relationship with compliance. This study obtained similar results [31,44,52]. The main idea is related to the perception of the taxpayer, and if the taxpayer's perception of public spending is positive, then the taxpayer will comply more with the rules and regulations (that is, if the public spending is directed through important public goods for the taxpayer, then the compliance level will increase). The authorities might increase taxpayers' confidence in the government if the revenue is well spent.

The quality of the education system is a measure of how well the education system meets the needs of a competitive economy. The impact of education on tax compliance has been analyzed in the literature, and positive relationships have been found [32,38,45]. An increased level of education among taxpayers might contribute to a better understanding of various socioeconomic phenomena, laws, and regulations. Thus, increasing the education level is a good policy for increasing compliance. The authorities can also conduct public awareness programs regarding the payment of taxes, risks, and associated benefits, as well as the rights and obligations as taxpayers. This might have a positive impact on compliance.

This research contributes to the literature on tax compliance by analyzing the influence of various indicators on tax compliance behavior in the EU context. The research employs the VECM technique, complemented by an SEM analysis, thus providing an interesting approach to this topic. The results of the study and the influences of various indicators on tax compliance may be useful to tax authorities in various countries in improving the policies adopted at the national level and the degree of the compliance.

7. Conclusions

This study empirically investigated the long-term relationships and the causal relationships between tax compliance, public trust in politicians, and power of authorities. The impulse function indicates that a positive shock in trust positively affects tax compliance. The SEM analysis focused on the correlation between tax compliance and the variables already discussed, but also on the correlation with other variables, such as the quality of the education system and the wastefulness of government spending.

The findings suggest that there is a Granger causality relationship, running from the trust variable (trust in politicians) to tax compliance. The findings of the SEM analysis underline that there are positive and significant influences on tax compliance from multiple variables, including the trust, quality of the education system, power of authorities, and wastefulness of government spending variables. These results emphasize the need for authorities to implement measures at the national level.

The study has its limitations, including the data set used. Due to the lack of data, this study only analyzed the period between 2007 and 2017, and did not consider the effects of Brexit and the COVID-19 pandemic. As future directions of research, a greater period might be considered. It is also important to extend the study using groups of countries with similar cultures and tax systems. This might bring interesting new results. More variables might be used (GDP, employment, etc.) for a better view of the tax behavior.

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