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Longevity of EU membership and VAT practices: Dependencies, Contradictions And Implications

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Abstract

The research aimed to analyze the influence of the standard VAT rate and the number of existing rates on the efficiency of VAT collection in the old and new member states of the European Union. The Student's t-test was applied to assess the significance of the model coefficients. P-values < 0.05 provide evidence that the parameter under test is significant. The study's conclusion is that a tax system containing a small number of reduced VAT rates and one relatively low standard rate of this tax is a system that will be less exposed to danger from unscrupulous entities practicing tax fraud.

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Keywords: Effective VAT rate; EU tax policy optimization; Tax gap; VAT harmonization

1. Introduction

Fiscal policy is one of the crucial elements of economic policy, since tax revenues provide income to cover national budget expenditures, while VAT is one of the most important sources of tax revenues in the EU member states (about 1/5 of all revenues). However, despite attempts

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to develop a policy of tax harmonization, fragmentation is noted in the EU VAT system, which creates an obstacle to effective trade in the common market (Kowal & Przekota, 2021), and the simultaneous effect of many tax rates exacerbates the problem (Sokolovska & Sokolovskiy, 2015).

The policy of tax federalism is the basis of tax policy and relationships between the EU and its member states in the tax sphere (Hoeller, 1996; Hinarejos, 2013). The concept of a common market implies the removal of obstacles to free trade in order to merge national markets into a single effective internal market. Ideally, to minimize economic distortions in the tax policy of an integration association, only one standard VAT rate should be applied (Bénassy-Quéré et al., 2014). Therefore, the EU has repeatedly tried to make it a harmonized tax that does not distort the conditions of competition (Diamond & Mirrlees, 1971; Institute for Fiscal Studies, 2011; Tudor, 2015).

The crisis phenomena in the EU economy are fueling research interest in evaluating the tax gap and the effectiveness of VAT collection in different EU countries; since this gap is considered a growing cause of negative consequences for economic policy (Abramovsky et al., 2017; Kalyva et al., 2016; Durán-Cabré et al., 2019). The policy of the EU states formulates the goal of combating tax evasion and tax fraud in direct and indirect taxation. Consequently, the exact determination of the VAT gap can be a fundamental step in assessing its effectiveness and revealing the extent of tax evasion (Nerudova & Dobranschi, 2019).

Thus, the aim of the present study is to analyze the impact of the standard VAT rate and the number of existing rates on the effectiveness of VAT collection in the old and new EU member states. It was assumed, that the EU countries with tax systems characterized by a small number of reduced VAT rates, demonstrate higher efficiency of tax collection, and the VAT gap is smaller.

2. Literature overview

2.1. Tax gaps and reduced efficiency of VAT collection: current condition in the EU

The importance of coordinating tax policy in the field of VAT is related to such factors as the functioning of the single market and the role of VAT as a revenue source for replenishing the EU's general budget (Bénassy-Quéré et al., 2014). The formation of a unified tax system is one of the crucial goals of creating a single market. However, the rejection of the tax sovereignty policy causes opposition from states and limits the possibility of achieving progress in the tax sphere (Bénassy-Quéré et al., 2014). In the EU member states, each country has a certain freedom in developing its own fiscal policy, adapting to pan-European conditions. VAT, as one of the clearest examples of this, is calculated based on the country of origin (Cnossen, 2018). At the same time, EU member states have the opportunity to apply reduced VAT rates for certain goods and services, which, as world practice shows, has positive consequences for the economy (Oliver et al., 2022), especially in the long term (Ciešlik & Turgut, 2021). Some Member States have the right to apply lower rates; however, in this case analyzing the impact of the rates on VAT revenues is complicated (Kristofferson, 2015). Effective fiscal policy faces many challenges, as governments need to determine whether existing conditions require higher taxes or incentive taxation (Tagkalakis, 2014).

Nevertheless, as for tax evasion motives, some researchers consider them the main reason for the VAT deficit (Poniatowski et al., 2020; Ponomarenko et al., 2020). The focus here should be on the concept of the tax gap as the difference between the tax actually paid and the tax that should have been paid (Lamensch, 2018) or as the amount of all frauds and tax evasion and as

an effectiveness indicator of the tax enforcement and fulfillment of obligations (Nguyen et al., 2020).

Among the macroeconomic and demographic factors of the VAT deficit, the economic condition plays a key role. Research results showed that more developed countries with high GDP per capita have a smaller VAT gap, while a high share of the shadow economy leads to an increase in the gap size (Zídková, 2014). In addition, eurozone members are supposed to be more effective in narrowing the VAT gap than non-eurozone countries, due to lower corruption and more efficient state institutions (Bénassy-Quéré et al., 2014).

The characteristics of tax systems are also defined as institutional factors affecting the VAT gap. The VAT gap is more significant in countries with higher tax rates (Szczypińska, 2019). Taxpayers in countries with high VAT rates occasionally apply the reduced rates to certain types of activities and goods in their own way to reduce tax payments. Effective social norms and high standards, strong objections to tax evasion lead to more efficient tax collection, and the high risk of poverty directly relates to the VAT deficit, involving a high level of social inequality in the state (Wiliński, 2019).

The researchers pay special attention to the problem of the tax administration effectiveness. An increase in tax administration costs (relative to net profit) can increase the efficiency of tax collection. The high efficiency of the tax system, an effective legal system and high penalties for tax fraud may limit the size of the VAT gap (Jaakkola, 2019).

The measures taken by the European Commission to simplify the VAT system, improve its reliability, efficiency and effectiveness, and also to combat tax fraud, have become especially relevant in the post-crisis period due to their impact on the expansion of the VAT base. However, in addition to the EU's general VAT initiatives, each member state solves the issues of VAT dependence in its own way. The most common approach is to reassess the rate system (Maşca et al., 2019).

It is important to note the so-called "carousel VAT fraud" as a negative manifestation of the reaction to the VAT structure in the EU countries. This implies real or fictitious transaction of goods that repeatedly change owners registered in two or more EU member states (Kowal, 2019). The maximum benefit from such fraud is achieved in areas of economic activity in which the VAT system assumes the presence of preferences (reduced rate or rate = 0%) (Buljat, 2017). Every year such schemes of VAT evasion cause significant losses for the national budgets of the EU member states (Borselli, 2011). According to EU estimates, in 2017 alone, the member states of the community lost about 137 billion euros of VAT revenue as a result of fraud, VAT evasion and optimization practices, financial insolvency, miscalculations and administrative errors (Feldek, 2020), and in 2019 VAT losses amounted to about 134 billion euros. In most EU member states, the absolute change in the VAT gap was less than 2% points (pp) per year. A significant reduction in the VAT gap was estimated in Croatia, Cyprus, Greece, Lithuania, Bulgaria and Slovakia (from -3.2 to -2.2 pp in the last four countries). Sweden, Finland and Estonia managed to limit VAT revenue losses to less than 5% of the target. The largest increase in the VAT gap was recorded in Malta (+5.4 pp), Slovenia (+3 pp) and Romania (+2.3 pp) (Asquith, 2021; European Commission, 2021a, 2021b).

Strong evidence proved that VAT fraud leads to discrepancies, especially for neighboring countries and the states with differentiated VAT rates (Braml & Felbermayr, 2021). The problems described above proves relevance of research in the field of tax policy in the EU countries, particularly, in the aspect of the dependence of the standard VAT rate and the number of existing rates on the effectiveness of VAT collection in the "old" and "new" countries of the European Union.

3. Materials and methods

The aim of the study is to analyze the impact of standard VAT rates and the number of existing rates on the effectiveness of VAT collection in EU countries. Achieving the study aim requires checking the following hypotheses:

- Tax fraud is less evident in EU countries with lower standard VAT rate (H0).
- The tax collection efficiency is higher and the VAT gap is smaller in the Member States with tax systems characterized by a small number of reduced VAT rates (H1).

3.1. Sample study

The analysis includes data on VAT collection and rates for a relatively stable economic period from 2011 to 2019. Earlier periods are excluded due to distorting manifestations of the 2008–2009 crisis, while later periods associated with the COVID-19 pandemic may also negatively affect the results. The study collects data from official EU statistics provided by the European Commission and Eurostat. The study contains data on 27 EU member states, not including data on the UK due to Brexit.

3.2. Research design

Due to the use of the quadratic function to describe the effectiveness of VAT collection, it was possible to analyze the pattern of the tax collection model effectiveness. It is important in conditions when the effectiveness of VAT collection may vary depending on changes in the rate. To assess the applicability of the model, a mathematical method was used, based on minimizing the square sum of functions deviations from the desired variables (the least squares method). Tax efficiency from VAT collection was calculated, according to the formula (OECD, 2012):

$$\text{VAT efficiency} = \frac{\text{VAT revenues}}{\text{Net consumer expenditures}} \tag{1}$$

The study used the calculations presented in Table 1.

These tools allowed conducting analysis of the interrelations between the VAT efficiency results and the collection inconsistency index by comparing the effectiveness of VAT collection with the VAT rates, applied in each country. The quadratic functional model used was chosen due to its simplicity and the ability to determine the effectiveness of changing the VAT rate. It

Table 1

The study's major calculated indicators.
Source: Daniel et al. (2003) and Nam et al. (2001)

Indicator	Calculation
VAT paid	VAT percentage × Net price of goods
Average VAT	$\frac{\text{Total VAT paid}}{\text{Total cost of purchase of goods}}$
Consumption expenditure	Total consumption expenditures + Total VAT paid
Net consumption expenditure	Total consumption expenditures – Total VAT paid

Table 2

VaT gap as a percentage of VAT total tax liability.

Country	Year		
	2017	2018	2019
Austria	8.5	9.0	7.5
Belgium	11.5	10.4	9.4
Bulgaria	12.2	10.8	11.1
Croatia	5.5	3.5	0.6
Cyprus	5.0	3.8	bd
Czech Republic	11.9	12.0	10.8
Denmark	8.2	7.2	7.8
Estonia	6.0	5.2	4.8
Finland	5.1	3.6	3.2
France	6.8	7.1	3.9
Germany	8.8	8.6	7.7
Greece	33.1	30.1	31.4
Hungary	13.5	8.4	6.6
Ireland	10.9	10.6	5.9
Italy	24.7	24.5	23.9
Latvia	13.9	9.5	6.6
Lithuania	25.1	25.9	21.6
Luxembourg	2.6	5.1	bd.
Malta	17.7	15.1	16.8
Netherlands	4.8	4.2	bd.
Poland	14.3	9.9	9.7
Portugal	10.9	9.6	7.0
Romania	34.3	33.8	33.4
Slovenia	4.4	3.8	2.3
Slovakia	19.6	20.0	16.6
Spain	6.4	6.0	3.1
Sweden	1.9	0.7	bd.
United Kingdom ^a	11.9	12.2	10.0

Note: Author's development built on data from European Commission (2020).

^a The United Kingdom has been outside the EU since 2020.

was proposed to use time as an explanatory variable in the model. The results of the VAT collection discrepancy index are presented in [Table 2](#).

The VAT collection efficiency was modeled using a quadratic function to determine the significance of its parameters. The values on the abscissa axis made it possible to group the EU member states depending on the effectiveness of VAT collection. The expected increase in the efficiency of VAT collection is described by the following quadratic function:

$$Y'(t) = at^2 + bt + c \quad (2)$$

where $y'(t)$ – the expected value of the efficiency of VAT collection, $t = 1, \dots, n$ – years of analysis.

An increase in the efficiency of VAT collection is assumed in the situation presented in the graph ([Fig. 1](#)).

The main characteristics of the quadratic function are those related to the location of the vertex, the direction and width of the arm, pivot point, and strength and direction of measuring

VAT Rates in Europe

Standard Value-Added Tax (VAT) Rates in European Union Member States and the United Kingdom, as of January 2021

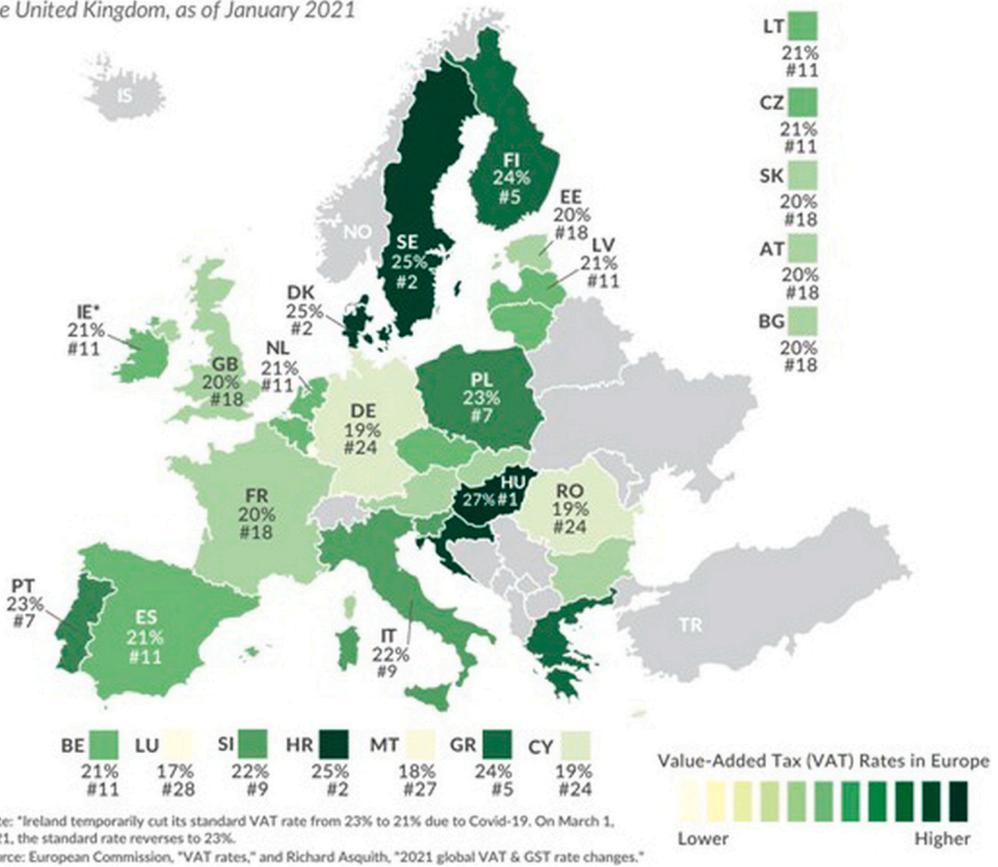


Fig. 1. The current state of VAT in EU countries and the UK. Source: Tax Foundation (2022).

the VAT collection efficiency. Thus, if it is assumed that only one base rate of this tax (A) is applied in the state tax policy, and there are no preferential (or zero) rates, the efficiency of the system will be achieved if.

$$Y'(t) = At \text{ for each } t = 1, n \tag{3}$$

But in reality, when there are preferential tax rates, exemption from VAT, as well as tax evasion and fraud when paying it, the model takes such form:

$$Y'(t) < At \text{ for } t = 1, n \tag{4}$$

The question is how the time function of the magnitude ratio $Y'(t)$ to the base velocity At would change. Presumably, the difference between them would be reduced. This can be achieved by taking measures against tax fraud, optimizing the system of preferential rates, and

Table 3
Conditions for determining the efficiency and inefficiency of the VAT collection system.

Conditions for an efficient VAT collection system		Conditions for an inefficient VAT collection system	
Situation 1	$a < 0; p \geq n$	Situation 4	$a < 0; 1 < p < n$
The parabola branches are directed downward ($a < 0$), the vertex (max) has not yet been reached ($p \geq n$). The efficiency of the VAT collection system is achieved, but slowly.		The parabola branches are directed downward ($a < 0$), the vertex (max) is reached during the analysis period ($1 < p < n$). The efficiency of the VAT collection system after the improvement in the first part of the analysis deteriorated in its second part. The parabola can also have such a position when the state policy to cut VAT rates is implemented.	
Situation 2	$a > 0; p < 1$	Situation 5	$a < 0; p < 1$
The parabola branches are directed upward ($a > 0$), the vertex (min) is reached in the first year of analysis ($p < 1$). The efficiency of the VAT collection system is growing very rapidly.		The parabola branches are directed downward ($a < 0$), the vertex (max) is reached before the completion of the first year of the analysis ($p < 1$). The efficiency of the VAT collection system is deteriorating rapidly.	
Situation 3	$a > 0; 1 < p < n$	Situation 6	$a > 0; p \geq n$
The parabola branches are directed upward ($a > 0$), the vertex (min) is reached during the analysis period ($1 < p < n$). The efficiency of the VAT collection system deteriorated in the first part of the analysis, but quickly increased in the second part.		The parabola branches are directed upward ($a > 0$), the vertex (min) is not reached during the analysis period ($p \geq n$). The efficiency of the VAT collection system is slowly declining.	

Note: Author's development

the practice of VAT exemption. The canonical form (in comparison with the general view of the VAT efficiency model proposed above) of the model would look like this:

$$Y' = a(t - p)^2 + q \quad (5)$$

where $(p; q)$ – the vertex of the function.

There can be such relations between the canonical form of the model and its general form ($Y'(t) = at^2 + bt + c$):

$$p = \frac{-b}{2a}$$

$$q = \frac{-(b^2 - 4ac)}{4a} \quad (6)$$

In fact, the canonical model and its general form are equivalents. However, for analysis with testing the significance of the parameters, it is easier to use the general model. At the same time, the position of the vertex of the function (p) is important for assessing the VAT collection efficiency (possible situations are shown in the table below). Thus, it is possible to formulate the conditions under which the tax system will be effective or not (Table 3).

3.3. Research limitations

The use of time as an explanatory variable in the constructed model imposes certain limitations. First, it does not allow making a conclusion about the effectiveness of tax reform at a certain moment, but demonstrates the cumulative effect of changes.

3.4. Statistical analysis

The significance of the model coefficients was assessed using the Student's t-test. Values expressed as $p < 0.05$ evidence that the parameter being tested is significant, allowing hypothesis H_0 to be rejected and hypothesis H_1 to be considered as accepted.

The significance of the modeling was determined using a statistical test, the test statistics of which, when the null hypothesis (H_0) is fulfilled, has the Fisher distribution (F-test).

4. Results

The EU countries' VAT collection efficiency model parameters are presented in Table 4.

The findings shows that most countries achieved improved efficiency of VAT collection, whereas, in some countries there was a decrease in the efficiency of VAT collection in the analyzed period. Group 1 included countries that have significantly increased VAT collection, which was due to different reasons. For example, Ireland and Croatia achieved an increase in the efficiency of VAT collection by raising tax rates, while in Latvia, Bulgaria, Malta and Estonia there was an opposite pattern.

The Czech Republic, Spain, Hungary and Slovenia took the border place between groups 1 and 2 (an increase in VAT rates can be considered a reason for increasing the efficiency of tax collection). Notably, some counties of Group 2 (namely, Greece, Italy and Cyprus) had taken measures to increase VAT rates, which led to an increase in the efficiency of tax collection, but

Table 4
parameters of the VAT collection efficiency model.

Country	R ²	p-Value (F Test)	a	p-Value	b	p-Value	c	p-Value	p
Austria	0.8859	0.0016	0.00001	0.8040	0.00051	0.2561	0.11489	0.0000	-24.79
Belgium	0.6747	0.0347	0.00014	0.0487	-0.00166	0.0252	0.10470	0.0000	6.15
Bulgaria	0.7897	0.0092	-0.00023	0.3349	0.00440	0.0868	0.11502	0.0000	10.01
Croatia	0.9889	0.0000	-0.00025	0.0987	0.00880	0.0004	0.15398	0.0000	18.34
Cyprus	0.9230	0.0005	0.00006	0.8129	0.00346	0.1540	0.09525	0.0000	-33.81
Czech Republic	0.9728	0.0000	-0.00034	0.0037	0.00579	0.0003	0.10360	0.0000	8.40
Denmark	0.9150	0.0006	0.00014	0.0992	-0.00014	0.8644	0.14655	0.0000	0.46
Estonia	0.8234	0.0057	-0.00010	0.6077	0.00297	0.1420	0.12947	0.0000	16.01
Finland	0.7679	0.0126	0.00019	0.1545	-0.00077	0.5266	0.13054	0.0000	2.13
France	0.9803	0.0000	0.00013	0.0029	-0.00030	0.3237	0.09505	0.0000	1.13
Germany	0.7394	0.0178	0.00007	0.0944	-0.00044	0.2995	0.10596	0.0000	2.93
Greece	0.8306	0.0050	0.00024	0.3932	0.00072	0.7861	0.08338	0.0000	-1.59
Hungary	0.8378	0.0043	-0.00049	0.1568	0.00829	0.0331	0.12254	0.0000	8.73
Ireland	0.9265	0.0004	-0.00021	0.1025	0.00447	0.0095	0.09317	0.0000	9.98
Italy	0.8754	0.0020	0.00007	0.3379	0.00030	0.7035	0.07792	0.0000	-1.96
Latvia	0.9748	0.0000	-0.00001	0.8950	0.00380	0.0130	0.09089	0.0000	129.97
Lithuania	0.8982	0.0011	0.00020	0.0260	-0.00093	0.2138	0.10663	0.0000	2.43
Luxembourg	0.3827	0.2354	-0.00006	0.9457	-0.00332	0.7336	0.17707	0.0001	-25.74
Malta	0.8411	0.0041	-0.00012	0.6830	0.00510	0.1481	0.09427	0.0000	19.84
Netherlands	0.9576	0.0001	0.00031	0.0128	-0.00091	0.3687	0.09905	0.0000	1.43
Poland	0.8310	0.0047	0.00075	0.0144	-0.00550	0.0546	0.11014	0.0000	3.60
Portugal	0.9356	0.0003	0.00007	0.5227	0.00148	0.2115	0.10347	0.0000	-10.55
Romania	0.8560	0.0031	-0.00027	0.5811	-0.00346	0.4842	0.13002	0.0000	-6.54
Slovenia	0.8070	0.0071	-0.00037	0.0803	0.00537	0.0225	0.10980	0.0000	7.46
Slovakia	0.6200	0.0550	0.00004	0.8839	0.00136	0.6075	0.09119	0.0000	-18.24
Spain	0.9858	0.0000	-0.00054	0.0004	0.00850	0.0000	0.05956	0.0000	8.03
Sweden	0.7837	0.0101	0.00019	0.1833	-0.00066	0.6404	0.13975	0.0000	1.67
United Kingdom									

Note: R² is the coefficient of determination of the model; p-Value (F-Test) is the level of significance of the model; a, b, c are the model parameters; p-Value is the level of significance of the model individual parameters, p is the abscissa (t-coordinates) of the model; and statistically significant parameters are in italics.

Author's calculations based on data from [European Commission \(2021a, 2021b\)](#)

did not show significant results. The increase in the efficiency of VAT collection in Austria, Portugal and Slovakia occurred without an increase in tax rates with insignificant result.

In Group 3, only France, the Netherlands and Sweden increased VAT rates. In the case of Lithuania, Belgium, Poland, France and the Netherlands, the effect of changing the efficiency of VAT collection varied. It is assumed that if countries have managed to improve the efficiency of VAT collection without increasing it, then they have reduced tax fraud. None of the EU countries fell into groups 4 and 6. Group 5 is represented by Luxembourg (an increase in the VAT rate with a decrease in the efficiency of tax collection) and Romania (a decrease in VAT with a decrease in the efficiency of tax collection). The formation of the VAT rates level is a widespread issue for fiscal decision makers. The analysis carried out within the framework of this study shows, that an increase in the VAT rate is accompanied with an increased efficiency of VAT collection (Fig. 2).

The situation is positively assessed in case replenishment of the state budget is prior. However, at the same time, the imbalance between the base VAT rates and the increase in the

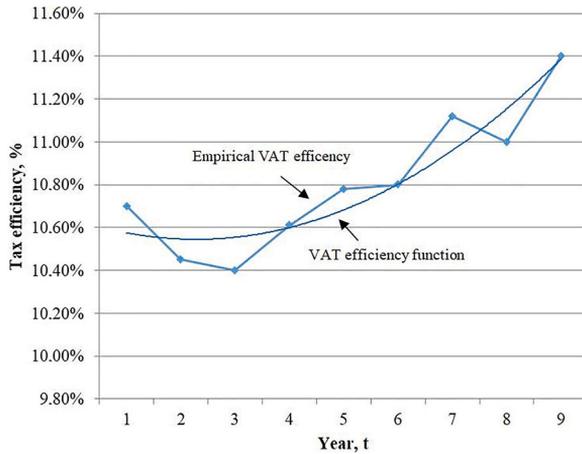


Fig. 2. Application of the function $Y^t(t) = at^2 + bt + c$ to describe the efficiency of VAT collection. Note: Author's development.

effective tax rate allows for an increase in tax fraud. It can be concluded that the second factor has a greater influence than the first (the coefficients of determination are 0.3437 and 0.0895, respectively). In addition, the number of VAT rates applied affects the effective VAT rate.

The analysis shows an increase in the gap between the standard and effective VAT rates. The results obtained can be interpreted as follows: an increase in the standard VAT rate by 1 pp is

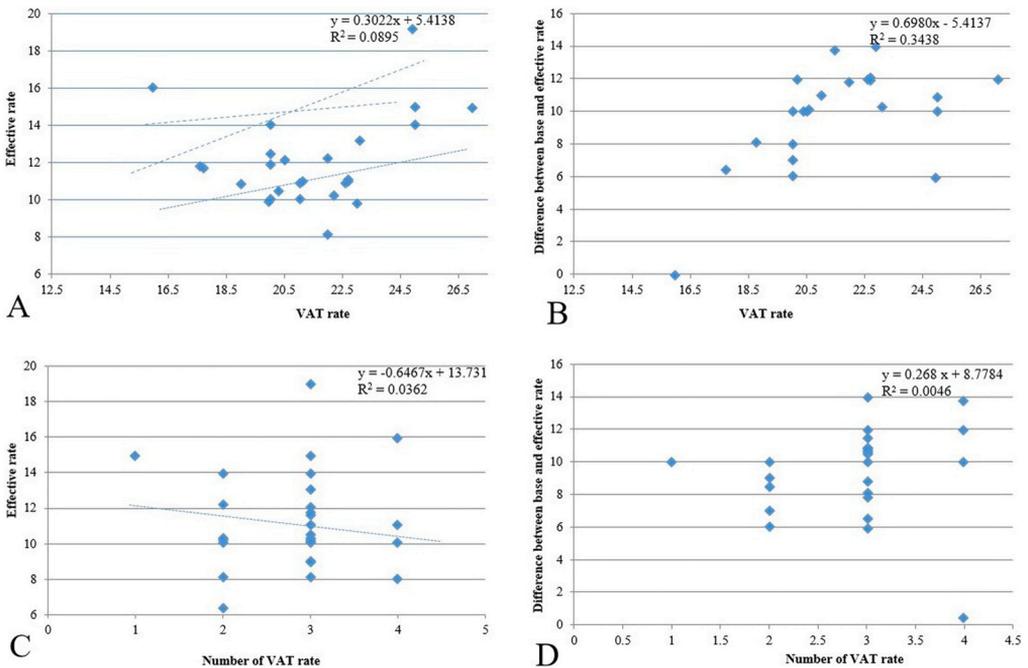


Fig. 3. The influence of the basic VAT rate and the number of rates on the VAT collection efficiency. Note: Author's development.

accompanied by an increase in the difference between the standard VAT rate and the effective VAT rate by 0.6980 pp. At the same time, an increase in the standard VAT rate by 1 pp leads to an increase in the effective VAT rate by 0.3022 pp. However, the growing gap between the standard and effective VAT rates causes economic damage.

There is also a close correlation, which can be described as negative, between the concepts of VAT collection efficiency and the tax gap (Fig. 3).

The interpretation led to conclusion that a higher efficiency of VAT collection is achieved with a smaller VAT deficit.

5. Discussion

The proposed model allows developing approaches to describing the effectiveness of VAT collection, such as assessing the impact of VAT rate reform on consumer spending for individual product groups. Based on the use of a quadratic system of the almost ideal demand system model (Janský, 2014), it gives results in terms of both evaluation methodology and empirical conclusions. Conclusions about the danger of the shadow economy and a high VAT deficit have been developed, which confirmed the findings of previous researchers that the shadow economy decreases the efficiency of VAT in the eastern group of EU countries (Nerudova & Dobranschi, 2019).

The data on gaps in VAT collection and its effectiveness were new content of research in this field. It was confirmed, that subjects tend to evade VAT taxation in the case of high rates and a complex taxation system (Malik et al., 2018). It was previously found that Belgium and France stand out from the western group of EU countries since their permanent VAT gap is much higher than their time-varying VAT gap. Meanwhile, there is no significant difference between the time-dependent and national VAT gap in Austria, Denmark, Finland, Germany, and Luxembourg. Portugal and Spain, which are members of the southern group of EU countries, showed a similar picture of the VAT deficit, and in the rest of the southern group, the permanent VAT gap was much higher than the time-varying one. The EU countries with the worst level of VAT revenue collection, namely Lithuania, Romania and Slovakia, showed the biggest discrepancy in early studies (Nerudova & Dobranschi, 2019).

When comparing the tax policy among the old and new EU members, the positive impact of a more developed fiscal system and tax administration was proved. Previously, efficiency, policy gap and compliance gap were calculated by researchers for all EU member states between 2005 and 2018. The efficiency and compliance gap was recorded higher in the new EU member states, while higher policy gap was demonstrated by older ones (Zídková et al., 2021). The correlation coefficient data for each country and the dynamics indicators revealed to early researchers a positive linear correlation in the Czech Republic, Finland and the UK. It was concluded that the number or spread of VAT rates was not a key factor in determining the VAT gap (Jarczok-Guzy, 2021; Szczypińska, 2019).

Future studies should conduct a similar analysis for countries outside the European Union. It would be useful and timely to identify the corresponding indicator for 2020 against the background of changes in the global economy due to the coronavirus pandemic. For instance, the experience of fiscal incentives in Germany shows a positive impact on the "coronavirus" economy in terms of GDP (Funke & Terasa, 2022). The perspectives of further study relate to testing the model on the economies of transition countries outside the EU. For example, since 2021, the Russian practice of VAT collection has been reformed, so it would be interesting to

analyze the effectiveness of VAT before the introduction of innovations and a few years later (Suslina & Leukhin, 2016).

6. Conclusions

The main conclusion of the study is that a tax system containing a small number of reduced VAT rates and one relatively low standard rate is a system that will be less exposed to danger from unfair entities practicing tax fraud. Almost all EU countries increased VAT rates during the analyzed period, using this tool to increase the revenue side of the budget. However, the increase in the effective VAT rate is weaker than in the standard tax rate, which can be interpreted as an expansion of the "gray" tax zone. Among the countries with unchanged VAT rates, Estonia, Malta, Poland, Portugal and Slovakia managed to achieve a noticeable improvement in the effective VAT rate in the analyzed period. The relevant issue is still the difference between the effective VAT rate and the standard rate when assessing the increase in the efficiency of tax collection. It is expected that EU member states with a greater difference in these indicators will experience serious problems with fraudulent schemes. Nevertheless, the measures to combat fraud may lead to an increase in the efficiency of VAT collection.

The stability of the tax system is crucial, since long-term constant VAT rates contribute to effective tax collection. However, it should be noted that VAT rates in Belgium and Austria have remained unchanged for several years, but they show different pattern of effective tax collection. Thus, it is impossible to draw a conclusion about the unambiguously positive or negative impact of this factor without considering other aspects of VAT collection.

The present conclusions and the assessment model can be used to improve the efficiency of fiscal policy management and the combat against tax fraud. In most EU countries, an increase in the efficiency of VAT collection has been achieved both by increasing the standard VAT rate and by revising it downwards. This is a convincing proof that the crucial problem is the control of fiscal authorities over possible frauds and their elimination, and not the level of standard VAT rates. The model may be in demand from both researchers and the fiscal policy authorities of national economies to improve the effectiveness of tax policy.

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Declaration of Competing Interest

Authors declare that they have no conflict of interests.

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