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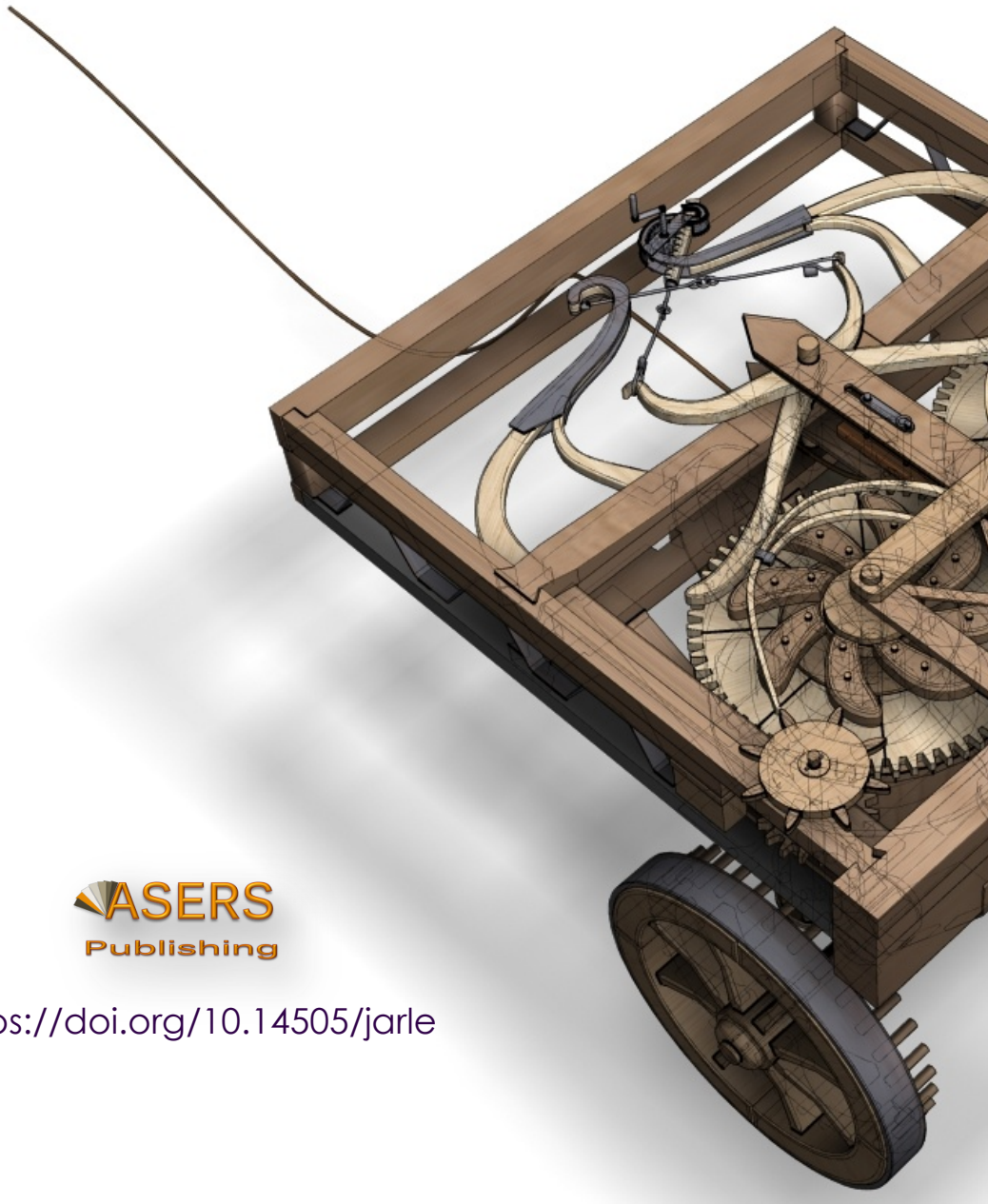

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Discrete Process of Development and Effective Functioning of the Fiscal System of the Ukraine and EU Countries

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Abstract:

The article considers the discrete process of development and effective functioning of the fiscal system of the European Union and Ukraine. A comprehensive methodological approach to the development, sustainability and efficiency of the fiscal system, which provides structural restructuring of the economic system and affects the 'fiscal maneuver' of the initial formative component, balances the specific interests of all subjects of redistributive relations. The typology of fiscal systems depending on the approved level of income tax rates, wages and other taxes is studied. The method of estimating the level of tax burden at the macro level is substantiated, which shows the share of GDP that is redistributed through the total amount of tax revenues to the budgets of all levels and extra-budgetary funds. The method of determining the level of tax burden and its impact on the consumer market and production (of goods), as well as the coefficient of elasticity of tax revenues to the State Budget, which embodies the fiscal effect of the impact on the system of tax revenues is shown. The three-stage structure of indicators is determined, which allows to calculate the integrated indicator of the state of the fiscal system and to determine the dynamics of the level of its security by stimulant factors and disincentive factors. The normalized values of stimulus factors and disincentive factors, as well as an integrated indicator of the state of the fiscal system of Ukraine are estimated and determined. The share of direct and indirect taxes in the GDP, as well as the structure of tax payments in the revenues of state budgets of EU member states are analyzed. A modification of the taxonomic indicator of indicative development of the fiscal system (indirect tax harmonization index) has been developed, which characterizes the level and dynamics, as well as changes in the directions and scales of consumption taxation

in EU member states and Ukraine under conditions of functioning in a single economic space with a certain degree of harmonization of the sphere of indirect taxes.

Keywords: tax burden; tax revenues; value added tax; income tax; excise tax; state budget.

JEL Classification: E62; G28; H22; H24; H25.

Introduction

An objective prerequisite for the development of the fiscal system is a change in the strategy of fiscal policy, the feasibility, and validity of goals, means and methods of its reform. The effectiveness of the fiscal system is associated with the theory of optimal taxation, aimed at creating a compromise between social justice of taxation and economic efficiency, as well as achieving the maximum level of implementation of the function of social welfare. At the same time, the formation of elements of the optimal fiscal system at the local level is one of the main factors improving the results of structural adjustment of the country's economy, the criteria for which are the accumulation of sufficient financial resources, income growth of economic entities (household income and corporate income) which is a factor of expanding the tax base, strengthening market mechanisms of self-regulation and reducing government influence on the development of the economic system. Problems of fiscal system development are related to modeling the relationship between macroeconomic indicators (optimization of proportions in the process of distribution and redistribution of GDP, determining the optimal ratio between liberal market and state methods of tax regulation of the economy, forming a new institutional environment of taxation, developing optimal variants of budget and tax policy), which in the space of decentralized territories should take into account the European integration vector of state transformation.

An important contribution to the formation of the scientific paradigm of the fiscal system in the context of decentralization was made by: Andrushchenko and Liashenko (2005); Dropa and Chaban (2009); Hostieva (2016); Hurnak (2010); Ivanov and Berezhna (2010); Krysovatyi, Melnyk and Koshchuk (2014); Kriuchkova (2016); Melnyk (2014); Poltorak and Holovko (2017); Shabaikovych and Perepichka (2016);. Sokolovska (2012); Tymoshenko (2017); study of the mechanism of transformation of the income tax system on the basis of fiscal decentralization was studied by Brooks, Godfrey, Hillenbrand and Money (2016) – in the process of considering the relationship between corporate tax and financial indicators; Creedy and Gemmell (2009) – during the analysis of the growth of tax revenues from corporate tax; Mitra (2017); Ramirez, Mauricio, B. Yadiraand Juan (2017); Shazmin, Sipan and Sapri (2016) – at the stage of presenting the impact of taxation on the activities of business entities; Cherkashyn (2017); Taptunova (2016); Suchyk and Kravchuk (2016); Tsyhaniuk (2016) – in the process of providing recommendations on the consequences of the transformation of income tax into a specialized tax on withdrawn capital.

Some aspects of the analysis of the current state of indicators of development, sustainability and efficiency of the fiscal system in their research were considered: Bohatyrova (2016); Dubynetska (2015); Ishchenko (2012); Khlivny, Tymchenko, Sybirianskaa nd Pyslytsia (2014); Lutsenko (2013); Petrenko (2012); Podik (2017); Tsymbaliuk and Kendiukhova (2013); Vykliuk and Herasyk (2013); Zaharova (2011); and other researchers. Highly appreciating the basic research of scientists, it should be recognized that the problem of indicative development of the fiscal system is insufficiently studied, which requires further study. The priority of our study is to substantiate a comprehensive methodological approach to the development, sustainability and efficient functioning of the fiscal system, which provides structural restructuring of the economic system and affects the 'fiscal maneuver' of the original formative component, balances the specific interests of all redistributive relations.

1. Materials and Methods

The effective activity of the state mechanism of the world countries to fully meet the collective needs is ensured by the minimum amount of tax payments and redistribution of total income (individual income and corporate profits). It is realized through basic (regulatory) and additional (distribution, incentive and deterrent, accumulative, providing) fiscal system and are represented by such parameters as: tax burden, quantitative and qualitative composition of taxes and fees, priority of taxation of certain areas or categories of payers, proportionality, progressiveness or regression of rates, distribution of accumulated tax payments between different types of budgets. We have proposed a comprehensive methodological approach to the development, sustainability and efficiency of the fiscal system of the state, which:

- creates a new self-regulatory model of taxation of business entities and an updated structure of the country's economy;

- stimulates business activity by paying the classic set of taxes and fees of the general system of taxation with the use of reduced rates;
- makes changes to the mechanism of implementation of the taxation system by providing taxpayers with opportunities to make an accurate assessment of taxable objects in order to bring them as close as possible to fair market value, achieve transparency of calculations and increase the share of tax revenues in the budget;
- actively uses the benefits of various taxes and fees in a changing institutional environment. If in a situation of low income of individuals and legal entities, there is a decrease in fiscal efficiency from direct taxes, then indirect taxes, including VAT in the structure of tax revenues are a priority, thus insuring budget revenues from inflationary factors. If in the situation of economic growth and increase of incomes of citizens and enterprises the share of direct taxes will be fairer, then the latter will increase in the structure of tax revenues to the budget;
- expands the tax base by abolishing inefficient tax benefits, increasing the efficiency and simplification of VAT, introducing coordinated action in the field of combating aggressive tax planning.

It should be noted that the policy of maximum taxes, which is actually based on the principle of 'collect the maximum from the possible' at the state level, approves a high level of rates on basic budget-forming taxes and expands their list, while reducing benefits. The risk of such a policy leads to the emergence of a 'fiscal trap', i.e. a situation where raising rates does not actually lead to an increase in tax revenues to the country's budget. At the same time, the policy of economic development, or the policy of 'smart taxes', which reduces the pressure in the field of taxation, simultaneously reduces the cost of social programs, but promotes entrepreneurial activity and creates a favorable tax climate. *The formation of the tax burden at the macro level.* Primarily its level is a consequence of the effectiveness of fiscal policy and it is provided through the following levers: the tax pressure of certain tax conditions; the level of distribution of the tax burden between payers of indirect taxes and consumers of products; the level of use of preferential taxation and preferences; the level of use of taxation technologies to increase the tax burden on taxpayers. Optimization of the tax burden on taxpayers provides: reduction of the tax burden through a gradual reduction of tax rates and expansion of the tax base; improving the functioning of tax administration systems and ensuring their transparency; reducing and ensuring an even distribution of the tax burden on taxpayers depending on the field of activity; improving tax control to prevent tax evasion; reducing the number of benefits and their effective use, which will ensure the formation of a fair fiscal system; formation and support of innovation and investment processes in certain sectors of the economy. Assessment of the tax burden at the macro level determines the use of two methodological approaches (Eqs. 1-2):

$$TR_v = \frac{TR}{GDP} \times 100, \quad (1)$$

$$TR_{v+GDP} = \frac{TR+CEF}{GDP} \times 100, \quad (2)$$

where,TR_v – the level of tax burden, which shows the share of GDP redistributed through the total tax revenues to the budgets of all levels, %; TR_{v+GDP}– the level of tax burden, which shows the share of GDP that is redistributed through the total amount of tax revenues to the budgets of all levels and extra-budgetary funds, %;TR– the total amount of tax revenues to the budgets of all levels; CEF– the total amount of contributions to extra-budgetary funds.

It is worth noting that in the realities of the state economy, there is a mechanism for VAT refunds through VAT bonds, which is positively perceived by businesses, as they are quite liquid (but at a significant discount). On the part of the state, this fiscal instrument is effective, although in reality money is not withdrawn from the budget. In fiscal accounts, VAT bonds reduce the level of budget revenues from VAT revenues. However, in reality, the funds due to the refund of VAT bonds remain as accumulated balances on budget accounts (Boiarchuk 2012). Thus, the tax burden in VAT is one of the important stages of regulating economic development in the country, because the excessive tax burden has a negative factor in fiscal policy, which slows down the normal functioning of enterprises and restrains the level of business activity. Instead, the excessively low tax burden causes the underpayment of tax payments, because of which the state cannot fully perform its functions. The optimal tax burden is the level at which business entities – taxpayers, in accordance with their solvency, are willing to pay certain macro-level tax payments, receiving from its qualitative public services (Aranchii and Mysnyk 2013). It should be noted that the fiscal burden is shifted to consumers or producers of products (goods) according to the elasticity of supply and demand. From the standpoint of determining the level of optimal tax burden, it is advisable to calculate the excessive tax burden based on the Dupuis-Marshall-Harberger measurement method (DMH

method), which features the possibility of using the concept of net surplus as an indicator of net consumer welfare. Determining the level of tax burden and its impact on the consumer market and production of products (goods) is represented by (Eq. 3) (Oparin *et al.* 2015):

$$TB = \frac{1}{2} \times ED_d \times TR \times P_{vat} \times G_{vat}, \quad (3)$$

where, TB – excessive tax burden; ED_d – price elasticity of demand; TR– tax rate; P_{vat} – price without VAT; G_{vat}– the volume of goods for which there is demand at a priceP_{vat}.At the same time, it should be remembered that a significant reduction in the tax burden on the general wage fund provides an increase in income. This fiscal effect has a positive impact on the system of formation of tax revenues to the State budget, the amount of change, which under the influence of economic factors determines the coefficient of elasticity (Eq. 4):

$$E_{tr} = \frac{\frac{\Delta y}{y}}{\frac{\Delta x}{x}}, \quad (4)$$

where,E_{tr} – the coefficient of elasticity of tax revenues; Δy– increase in tax revenues;y– the initial amount of tax revenues; Δx– increase of the studied factor; x– the initial volume of the studied factor. As factors influencing the level of tax revenues, adjusting its value by 1%, as a qualitative criterion for indicative development, sustainability and efficiency of the fiscal system, most countries choose: GDP per capita, household income, sales of industrial products the average monthly nominal wage. It should be noted that in the case of inelastic demand, the distribution of the tax burden is formed at the expense of the consumer. That is, with a high level of elasticity of demand and low – elasticity of supply, the tax burden of paying VAT to the State budget is transferred to the taxpayer; with less elasticity of demand and greater elasticity of supply there is an increase in the amount of VAT paid by consumers. The calculation of the indicator $G_{vat}$for the relevant products (goods) is based on (Eq. 5):

$$G_{vat} = G_i + G_i \times \Delta d, \quad (5)$$

where, G_i – is the volume of sold products in the corresponding period.

At the same time, the complex discrete process of indicative development, sustainability and efficiency of the country's fiscal system determines the development of methods for assessing the indicators of the integrated indicator of the fiscal system, the value of which allows determining the dynamics of its security by change factors. The range of characteristic values of indicative indicators of development and effective functioning of the fiscal system(I_{FS})should be measured from 0 to 1,with their division into 5 intervals, namely (Eq. 6):

$$[y_0, y_{crit}), \left[y_{crit}, y_{dang}\right), \left[y_{dang}, y_{uns}\right), [y_{uns}, y_{sat}), \left[y_{sat}, y_{optim}\right), \quad (6)$$

where,y_0 – valueI_{FS}, which corresponds to the zero level of security of the fiscal system; y_{crit}– valueI_{FS}, which corresponds to the critical (20%) level of security of the fiscal system; y_{dang}– valueI_{FS}, which corresponds to the dangerous (40%) level of security of the fiscal system; y_{uns}– valueI_{FS}, which corresponds to the unsatisfactory (60%) level of security of the fiscal system;y_{sat} – valu eI_{FS}, which corresponds to a satisfactory (80%) level of security of the fiscal system;y_{optim} – valueI_{FS}, which corresponds to the optimal (100%) level of security of the fiscal system.

The selected indicators have a three-stage typological structure: stimulus indicators, when between I_{FS} and the integrated indicator of development, sustainability and efficiency of the state fiscal system (I_{EFS}) the reis a direct connection; disincentive indicators–when between I_{FS} and I_{EFS} there is feedback; mixed type – plays the role of a stimulant at a certain moment, after which it becomes a disincentive of the state of development, stability and efficiency of the fiscal system of the state. To bring completely different types and values I_{FS} to information unidirectionality, it is necessary to implement a discrete process of standardization of indicators using a methodological approach to assess indicators of development, sustainability and efficiency of the fiscal system (Methodical recommendations 2013). StandardizationI_{FS}- stimulants is realized using a group of Equations(7-13):

$$y_{ij} = 0.2 \times \left(\frac{x_{ij} - x_{crit}}{n_i}\right), \; x_{ij} \leq 0, x_{ij} \leq x_{crit}, \quad (7)$$

$$y_{ij} = 0.2 \times \left(\frac{x_{ij}}{x_{crit}}\right),\ 0 \le x_{ij} \le x_{crit}, \quad (8)$$

$$y_{ij} = 0.2 + 0.2 \times \left(\frac{x_{ij}-x_{crit}}{x_{dang}-x_{crit}}\right),\ x_{crit} \le x_{ij} \le x_{dang}, \quad (9)$$

$$y_{ij} = 0.4 + 0.2 \times \left(\frac{x_{ij}-x_{dang}}{x_{uns}-x_{dang}}\right),\ x_{dans} \le x_{ij} \le x_{uns}, \quad (10)$$

$$y_{ij} = 0.6 + 0.2 \times \left(\frac{x_{ij}-x_{uns}}{x_{sat}-x_{uns}}\right),\ x_{uns} \le x_{ij} \le x_{sat}, \quad (11)$$

$$y_{ij} = 0.8 + 0.2 \times \left(\frac{x_{ij}-x_{sat}}{x_{optim}-x_{sat}}\right),\ x_{sat} \le x_{ij} \le x_{optim}, \quad (12)$$

$$y_{ij} = 1,\ x_{ij} \ge x_{optim}, \quad (13)$$

Standardization I_{FS} – dissimulators is realized using a group of Equations (14-19) (Methodical recommendations 2013):

$$y_{ij} = 1,\ x_{ij} \le x_{optim}, \quad (14)$$

$$y_{ij} = 0.8 + 0.2 \times \left(\frac{x_{sat}-x_{ij}}{x_{sat}-x_{optim}}\right),\ x_{optim} \le x_{ij} \le x_{sat}, \quad (15)$$

$$y_{ij} = 0.6 + 0.2 \times \left(\frac{x_{uns}-x_{ij}}{x_{uns}-x_{sat}}\right),\ x_{sat} \le x_{ij} \le x_{uns}, \quad (16)$$

$$y_{ij} = 0.4 + 0.2 \times \left(\frac{x_{dang}-x_{ij}}{x_{dang}-x_{uns}}\right),\ x_{uns} \le x_{ij} \le x_{dans}, \quad (17)$$

$$y_{ij} = 0.2 + 0.2 \times \left(\frac{x_{crit}-x_{ij}}{x_{crit}-x_{dang}}\right),\ x_{dang} \le x_{ij} \le x_{crit}, \quad (18)$$

$$y_{ij} = 0.2 \times \left(\frac{x_{ij}}{x_{crit}}\right),\ 0 \le x_{ij} \le x_{crit}, \quad (19)$$

where, x_{ij} – the value of the i-th I_{FS} in the period j; y_{ij} – normalized value x_{ij}; n_i – smoothing constant.

The discrete process of development, sustainability and efficiency of the fiscal system in the study period is integrated by(Eq. 20):

$$I_{EFS} = \left(\sum_{i=1}^{12} d_i y_i\right) \times 100, \quad (20)$$

where, I_{EFS} – an integrated indicator of development, sustainability and efficiency of the fiscal system of the state,%; d_i – weighting coefficient I_{FS}, determined by the method of expert assessments, which provides information on the amount of contribution to the integrated factor of this indicator; y_i – normalized value I_{FS}.The introduction of a methodological approach, on the one hand, will allow to effectively performing the fiscal function of national and local taxes and fees, and on the other – to promote the effective balancing of revenues and expenditures of state and local budgets.

2. Results and Discussion

We have formed the list of factors of change of the integrated indicator of a condition of development, stability and efficiency of functioning of fiscal system, which, in our opinion, are the most important: x_1 – the share of tax revenues in the structure of state budget revenues, %; x_2 – the share of tax revenues in the structure of local budget revenues, %; x_3 – the coefficient of efficiency of administration of tax revenues to the State budget, %; x_4 – the coefficient of efficiency of administration of tax revenues to local budgets, %; x_5 – the degree of fulfillment of indicative indicators of budget VAT refund, %, %; x_6 – the specific weight of the balance of unreimbursed amounts of VAT in the amount of nominal GDP, %; x_7 – the concentration of tax debt in the Consolidated Budget revenues, %; x_8 – the total tax rate (Doing Business), %; x_9 – the time for tax reporting, hours per year; x_{10} – the level of timely submission of tax returns, %; x_{11} – the coverage ratio of tax audit by risk management system; x_{12} – the share of tax returns filed through electronic services, %. Assessment of the state of development, sustainability and efficiency of the fiscal system of Ukraine by factors of change are presented in Table1. The three-stage structure of the selected factors of change I_{EFS} is formed from indicators-stimulators (x_1, x_2, x_{10}, x_{11}, x_{12}), which have a direct connection between I_{FS}; disincentive indicators – (x_6,x_7,x_9), which have feedback between I_{FS}; mixed factors – (x_3,x_4,x_5,x_8), which play the role of stimulants at time t, after which they become functioning disincentive factors I_{EFS}.

Table 1. Evaluation of indicators of development, sustainability, and efficiency of functioning fiscal system of Ukraine for 2013 - 2019

I_{FS}	2013	2014	2015	2016	2017	2018	2019
x_1	69.35	83.15	79.39	77.46	78.46	76.58	81.76
x_2	42.39	40.26	38.11	41.26	37.69	33.36	40.13
x_3	95.71	101.77	88.29	93.03	95.76	99.87	100.26
x_4	97.38	99.37	99.42	94.47	92.34	113.33	111.41
x_5	92.62	108.56	95.76	89.83	86.73	105.08	99.5
x_6	1.10	0.35	0.24	0.47	0.85	0.65	0.51
x_7	7.08	2.69	2.66	3.11	6.99	9.26	11.85
x_8	57.1	55.4	54.4	52.7	52.2	51.9	51.9
x_9	657	491	390	350	350	356	356
x_{10}	94.3	97.4	96.5	95.7	92.4	95.7	97.6
x_{11}	37.1	24.7	30.1	28.3	25.7	19.4	51.2
x_{12}	10.7	17.8	37.9	38.7	41.4	46.3	73.0

Source: Calculated by the authors.

The values of the indicators were determined using the analog method (x_1,x_2,x_8,x_9) and expert evaluation (x_3,x_4,x_5,x_6,x_7,x_{10},x_{11},x_{12}), which are systematized in Table 2.The set of weight coefficients of the integrated indicator of the state of development, stability and efficiency of the functioning of the fiscal system of Ukraine (I_{EFS}) was determined by expert evaluation (Table 3).

Table 2. The value of indicators of the state of development, sustainability and efficiency of the fiscal system of Ukraine

I_{FS}	ValuesI_{FS}									
	RangeI_{FS}- stimulants					RangeI_{FS}-destimulators				
	$y_{s_{crit}}$	$y_{s_{dang}}$	$y_{s_{uns}}$	$y_{s_{sat}}$	$y_{s_{optim}}$	$y_{d_{optim}}$	$y_{d_{sat}}$	$y_{d_{uns}}$	$y_{d_{dang}}$	$y_{d_{crit}}$
x_1	55	60	65	70	80	–	–	–	–	–
x_2	35	40	50	60	70	–	–	–	–	–
x_3	90	93	96	98	100	102	108	110	115	120
x_4	90	93	96	98	100	102	108	110	115	120
x_5	90	93	96	98	100	102	108	110	115	120
x_6	–	–	–	–	–	0.05	0.10	0.35	0.55	0.75
x_7	–	–	–	–	–	1.00	3.00	5.00	7.00	9.00
x_8	25.6	26.9	28.7	30.2	34.2	40.8	41.6	47.1	52.5	55.0
x_9	–	–	–	–	–	164	210	233	355	370
x_{10}	93.5	95.0	97.0	99.5	100	–	–	–	–	–
x_{11}	15	35	50	65	75	–	–	–	–	–
x_{12}	50	65	80	90	100	–	–	–	–	–

Source: calculated by the authors.

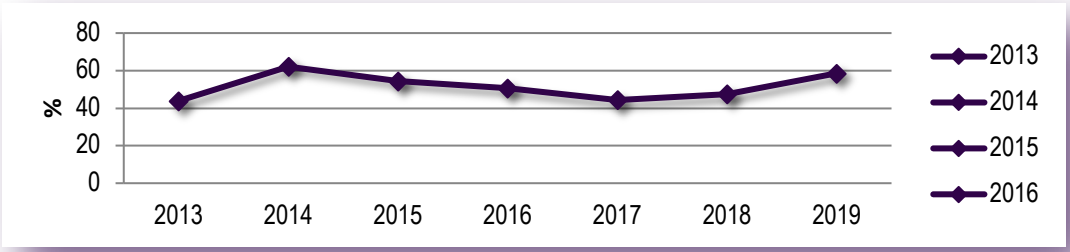
Table 3. Dynamics of normalized values I_{FS}andI_{EFS} of Ukraine

I_{FS}	Weighting coefficientI_{FS}	2013	2014	2015	2016	2017	2018	2019
x_1	0.0804	0.774	1.000	0.988	0.949	0.969	0.932	1.000
x_2	0.0803	0.448	0.405	0.324	0.425	0.308	0.191	0.403
x_3	0.0903	0.581	1.000	0.196	0.401	0.584	0.987	1.000
x_4	0.0956	0.738	0.937	0.942	0.498	0.356	0.467	0.544
x_5	0.0777	0.375	0.744	0.584	0.200	0.191	0.897	0.950
x_6	0.0863	0.136	0.600	0.688	0.480	0.176	0.300	0.440
x_7	0.0874	0.392	0.831	0.834	0.789	0.401	0.194	0.152
x_8	0.0901	0.193	0.199	0.248	0.384	0.411	0.422	0.422
x_9	0.0801	0.113	0.151	0.190	0.445	0.445	0.387	0.387
x_{10}	0.0745	0.500	0.500	0.500	0.500	0.500	0.470	0.648
x_{11}	0.0785	0.500	0.500	0.500	0.500	0.500	0.244	0.616
x_{12}	0.0788	0.500	0.500	0.500	0.500	0.500	0.185	0.507
I_{EFS}	x	43.87	62.09	54.43	50.63	44.31	47.44	58.57

Source: Calculated by the authors.

The results of the assessment I_{EFS} of Ukraine are presented in Figure 1.Thus, the integrated indicator I_{EFS} for 2013 – 2019 increased from 43.87% to 58.57%, which is due to a decrease in the number of taxes and the time required to summarize the results of tax accounting in the reporting, increasing the efficiency of administration of tax revenues, implementation of indicative budget indicators, reduction of the general tax rate and other changes. The obtained values should be used in the process of assessing the level of financial security of the state.

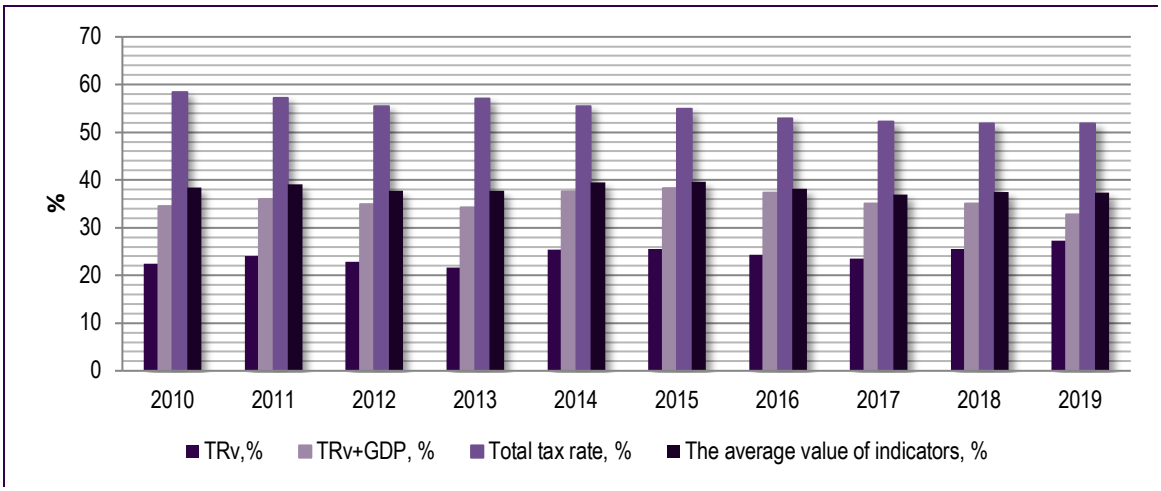
Figure 1. Dynamics of the level of the integrated indicator I_{EFS} in Ukraine for 2013 – 2019, %



Source: Calculated by the authors.

The amount of tax burden at the macro level is presented in Figure 2.

Figure 2. Coefficients of tax burden of the macro level of Ukraine for 2010-2019, %

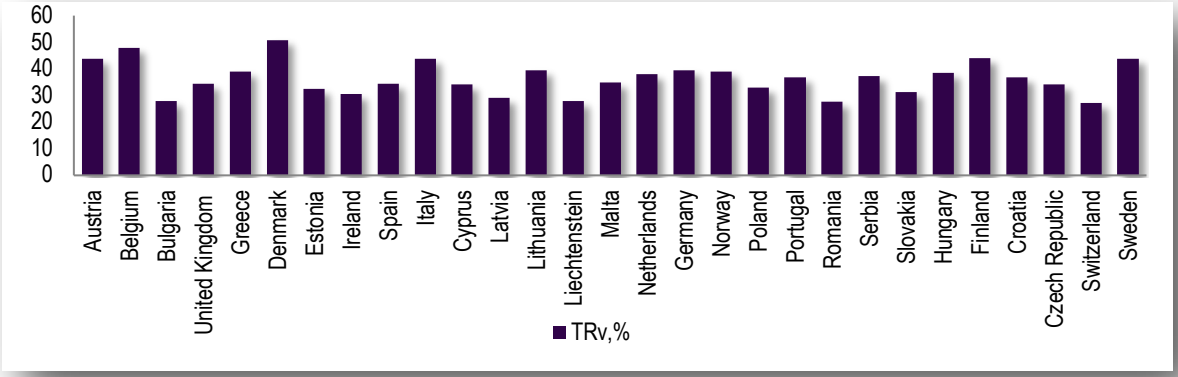


Source: Calculated by the authors.

Thus, the level of tax burden in the structure of the share of GDP redistributed to the budgets of all levels increased from 22.4% in 2010 to 27.3% in 2019. The most significant decrease in this indicator in 2012-2013 and 2016-2017 is due to financial instability in the country. This significantly affected both the level of economic development of the state and the amount of tax revenues to the budgets of all levels. The level of tax burden in the structure of the share of GDP, which is redistributed to the budgets of all levels and extra budgetary funds, on the contrary, decreased from 34.5% in 2010 to 32.8% in 2019, due to a significant reduction in the rate of single social contribution to22%. Moreover, the probability of growth of the forecast indicator $TR_{v+GDP}$for 2020-2021 is equal to the level 39.5%.

In Ukraine, during the last six years (2014 – 2019) there have been changes in the fiscal system, namely: the tax base has been expanded, the corporate income tax rate has been reduced from 25% to 18%; and the personal income tax rate has been set at the level 18%; taxation of passive income from deposits and pensions was introduced at the rate 15%, which was increased to 20% and a military tax was introduced at the rate 1.5%; indirect tax rates increased (VAT rate was maintained at the level of 20%, but its reduction to 7% for taxation of operations on supply of medicines and medical devices was introduced; gradual increase of excise tax rates was introduced). It is determined that the structure of revenues in the state budgets of EU member states is almost 71% formed at the expense of tax revenues (Figure 3). Thus, the most dependent on tax revenues and social contributions are Denmark (taxes make up 50.8% the country's GDP), Belgium (47.9%) and France (47.9%), the lowest percentage of tax revenues in GDP is in Switzerland (27.1%), Bulgaria (27.8%) and Romania (27.7%).

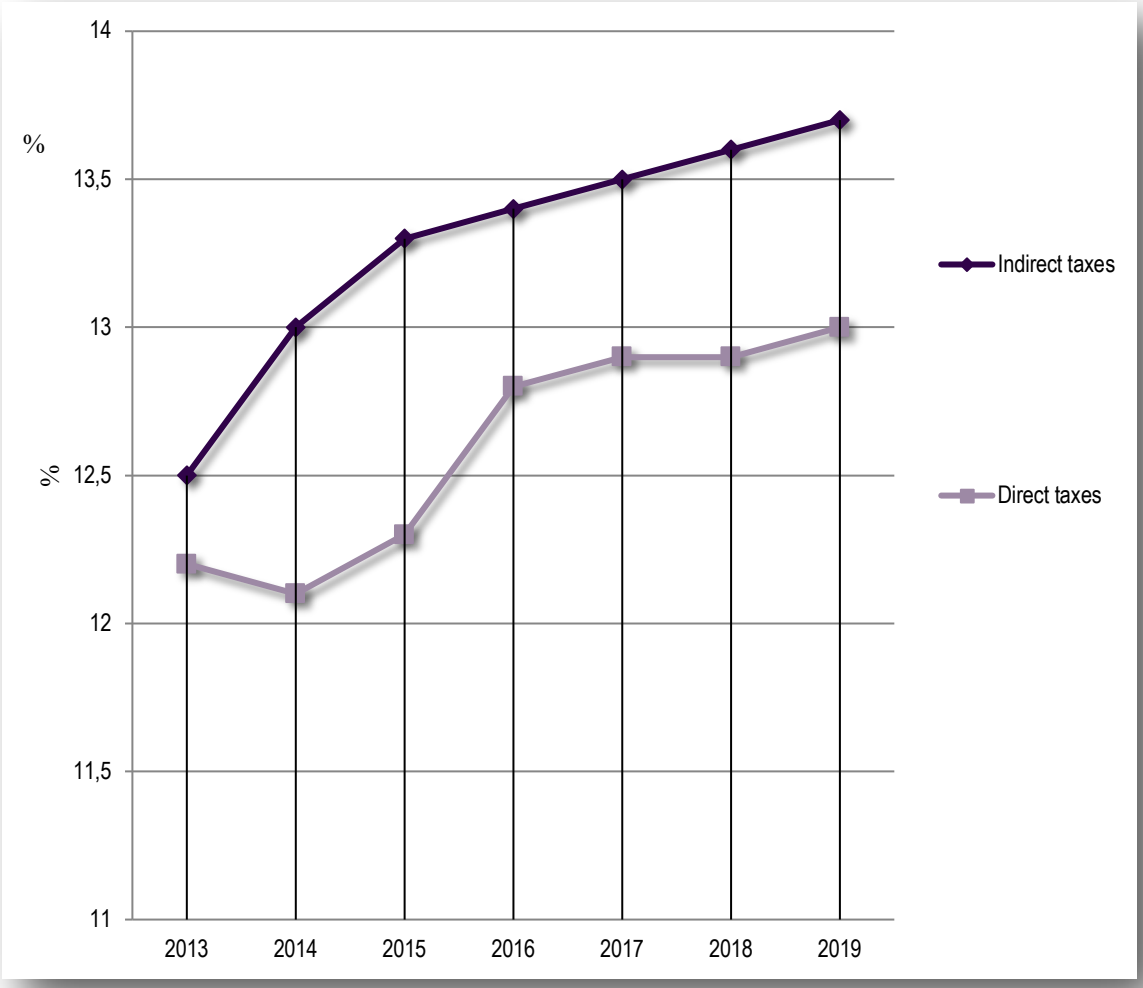
Figure 3. The amount of tax revenues and social contributions in the EU countries in 2019, % of GDP



Source: Calculated by the authors.

We should note that the change in instruments and factors of indicative development, sustainability and efficient functioning of the fiscal system in the EU member states occurred due to an increase in the rate of indirect taxes, in particular, VAT (Figure 4).

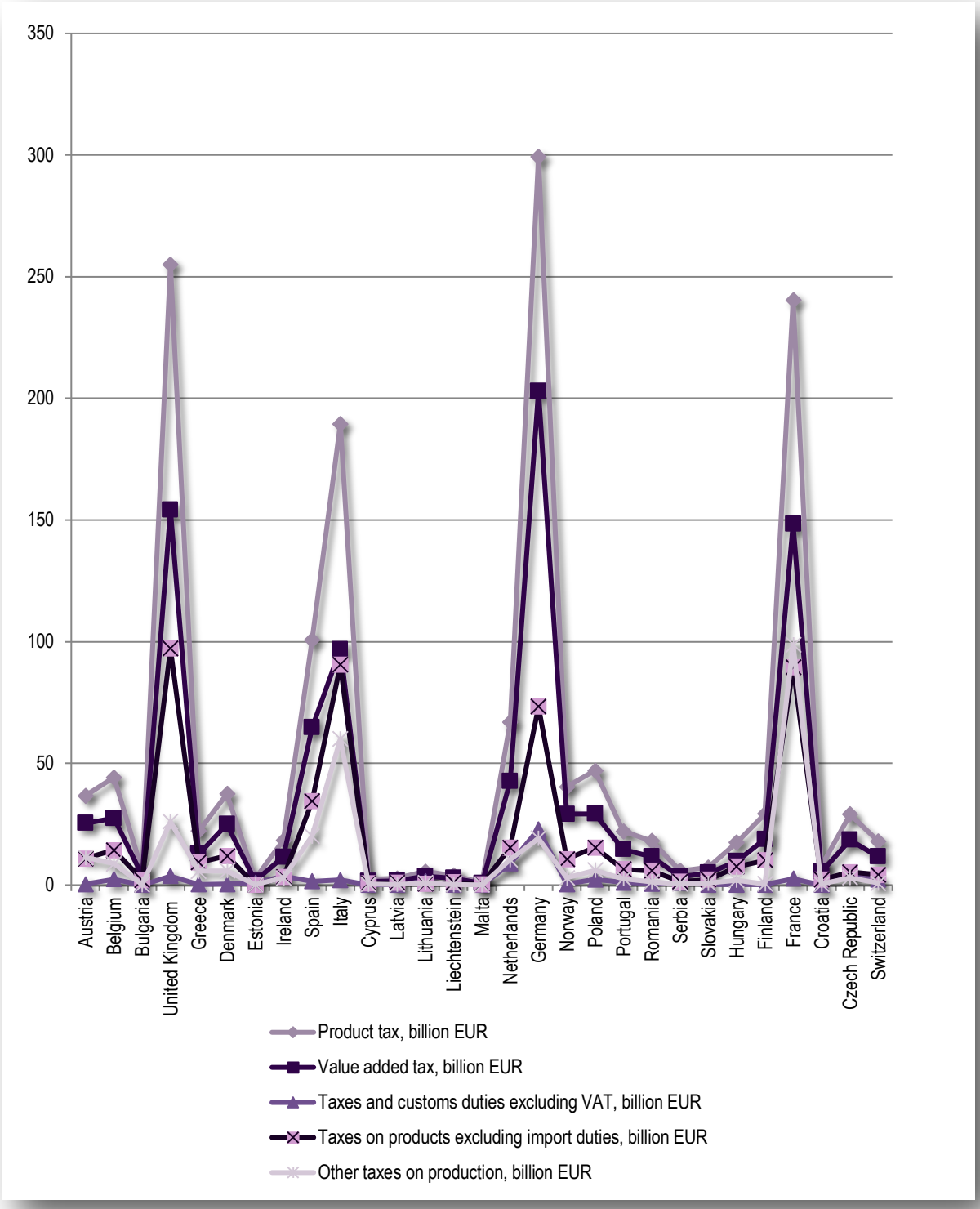
Figure 4. The share of direct and indirect taxes in the GDP of EU member states for 2013 – 2019, %



Source: Calculated by the authors.

Thus, the trend of increasing indirect taxes in order to fill the budgets began in 2013, as in this period there was a lack of direct tax revenues, which provoked the largest level of budget deficits in EU member states. We should note that in 2011 the share of direct and indirect taxes was equal to 13.27%, in 2012 direct taxes were13.07% and 12.9% indirect. In 2019, the difference between the share of indirect and direct taxes in GDP fluctuates within 0.7%.The largest share of indirect taxes, which ensured the receipt of tax payments and social contributions to the budget in Bulgaria was 52.37%, in Croatia it was equal to 51.28%, Sweden – 50.55% and Serbia – 50.42%; the lowest – in the Czech Republic (22.50%), Germany (27.66%) and Norway (29.39%). In general, the average indicator of indirect taxes in the composition of tax payments and social contributions in the EU-28 was 33.97%, in the EU-19 – 32.05%; direct – EU-28 – 32.08%, EU-19 – 30.04%. The difference between the shares of indirect taxes in the EU countries fluctuated in the range 52.37 – 22.50%, which ensured the effectiveness of the fiscal system of states and their 'unity in diversity'. In recent years, there has been a tendency in EU member states to gradually shift the tax burden from production (capital and labor taxation) to consumption. This allowed reducing the rates of direct taxes and, accordingly, their importance in filling the budgets (Figure 5).

Figure 5. The amount of tax revenues to the state budgets of EU member states on taxes for production and imports in 2019, billion EUR

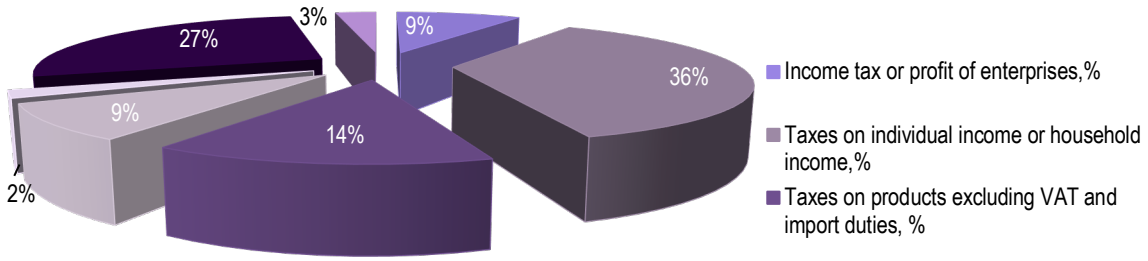


Source: Calculated by the authors according to the data Taxation Trends in the European Union (2019).

Thus, in 2019, the EU-28 collected 1898.2 billion EUR of all types of indirect taxes and 1792.2 billion EUR of direct taxes. The volume of fiscal payments to the budgets of the EU-19 countries had the following structure: indirect taxes – 1343.8 billion EUR, direct – 93.3% (1259.4 billion EUR). Among the EU countries, the main 'fillers' of the joint budget in terms of direct and indirect taxes are Italy (13.14% indirect taxes and 13.25% direct),

Germany(16.78% and 19.28% respectively) and France (17.85% and 15.06% respectively).In general, the share of VAT in tax revenues in the EU countries in 2019 was26.19% (in the EU-19 – 24.75%). Other taxes of the group of indirect fiscal payments occupied 25% tax payments to the budget. Regarding direct tax revenues, they formed 48% fiscal payments (the main ones are taxes on individual income or household income – 36%, taxes on income or corporate income – 9%) (Figure 6).

Figure 6. The structure of tax payments in the revenues of state budgets of EU member states in 2019, %



Source: Calculated by the authors according to the data of D. Boiarchuk (2012).

The highest share of VAT in tax payments to the budget is in Croatia (50%), Liechtenstein (45.68%) and Bulgaria (44.28%), the lowest – in the Czech Republic (17.13%), Denmark (19.09%) and Italy (19.83%). Instead, the share of other indirect tax payments (excise and duties) is high in Hungary (36.67%), Serbia (34.38%) and Greece (33.68%), the lowest – in Denmark (14%), Norway (12.8%), Finland (16.8%) and the Czech Republic (12.72%). In order to generalize the features of the fiscal system of the EU member states and determine the directions of transformation of the Ukrainian taxation system, the states were united (using cluster analysis tools) into large groups according to the similarity of vectors of their fiscal policies on the basis of 26 indicators, which were united according to the following criteria: (1) fiscal sufficiency (level of full tax burden, share of direct and indirect taxes, as well as social security contributions in the tax burden); (2) economic efficiency (effective rates of consumption taxes, capital and energy taxes, VAT levels, income taxes and environmental taxes); (3) social justice (effective tax rate on labor, levels of individual income taxes and social contributions); (4) flexibility (growth rates of real GDP, exports (imports), cash incomes, real wages, levels of fixed capital investment, gross profit, income (expenditure), budget deficit (surplus), employment, unemployment, inflation index) (Baunsgaard and Keen 2019). Given the high degree of discrete process governing VAT and excise tax in the EU, as well as mechanisms for their administration in Ukraine, we made an integrated assessment of the level of harmonization of indirect taxation in European countries (subject to hypothetical enrollment of Ukraine in the EU) based on the developed algorithm (Figure 7).

The Indirect Taxation Harmonization Index (I_{hit}) was developed as a modification of the taxonomic indicator of indicative development, which characterizes the level and dynamics, as well as the change of directions and scales of consumption taxation in EU member states under the functioning of the single economic space with a certain degree of harmonization of the fiscal system in the field of indirect taxes. The results of calculations of the indicator$I_{hit}$are shown in Figure 8.

Figure 7. Algorithm for calculating the index of harmonization of indirect taxation (I_{hit}) in the EU member states and Ukraine

1. Formation of a matrix of observations in the coordinates 'year $(i, i \in (1; n))$– - value (x)'for each studied country $(k, k \in (1; 28))$ by indicators $(j, j \in (1; 8))$.

1) the level of full tax burden(TR), %; 2) the share of indirect taxes in the tax burden (F_{TR}), %; 3) the share of VAT in GDP (F_{VAT}), %; 4) the share of excise tax and other consumption taxes in GDP (F_{Exc}), %;
5) effective rate of consumption taxes (ECT_r), %;
6) VAT harmonization level index (I_{VAT}), %:

$\mathrm{I}_{VAT\,k,i} = \frac{\mathrm{ECT}_r^{VAT}{}_{k,i}:\mathrm{ECT}_{rk,i}}{\mathrm{ECT}_r^{VAT}{}_{t,i}:\mathrm{ECT}_{rt,i}} \times 100\%$ where, $\mathrm{ECT}_r^{VAT}{}_{k,i}: \mathrm{ECT}_{rk,i}$, $\mathrm{ECП}_r^{VAT}{}_{t,i}: \mathrm{ECT}_{rt,i}$ – shares of VAT in ECT_r of a separate country *k*and a set of countries*t*(EU-28 + Ukraine) in the period respectively;

7) index of the level of harmonization of excise tax on energy products (I_{Exc}^{e}):

$(I_{Exc}^{e}) = \frac{\mathrm{ECT}_{rk,i}^{\mathrm{e}}:\mathrm{ECT}_{rk,i}}{\mathrm{ECT}_{rt,i}^{\mathrm{e}}:\mathrm{ECT}_{rt,i}} \times 100\%$ where, $\mathrm{ECT}_{rk,i}^{\mathrm{e}}: \mathrm{ECT}_{rk,i}$, $\mathrm{ECT}_{rt,i}^{\mathrm{e}}: \mathrm{ECT}_{rt,i}$ – shares of excise tax on energy products;

8) index of the level of harmonization of the excise tax on alcoholic beverages and tobacco products (I_{Exc}^{ab}):

$I_{Exc}^{ab} = \frac{\mathrm{ECT}_{rk,i}^{ab}:\mathrm{ECT}_{rk,i}}{\mathrm{ECT}_{rt,i}^{ab}:\mathrm{ECT}_{rt,i}} \times 100$ where, $\mathrm{ECT}_{rk,i}^{ab}: \mathrm{ECT}_{rk,i}$, $\mathrm{ECT}_{rt,i}^{ab}: \mathrm{ECT}_{rt,i}$ – shares of excise tax on alcoholic beverages and tobacco products.

2. Standardization of values of elements of the matrix of observations (z_{ij})based on deviations from the average value.

3. Formation of a reference vector (z_{0j}) on the basis of certain sets of features (stimulants and destimulators).

4. Calculation of the distance (r_{i0})between the individual elements of the matrix of standardized values and the reference vector.

$$r_{i0} = \sqrt{\sum_{j=1}^{8} (z_{ij} - z_{0j})^2}$$

5. Calculation of the index of harmonization of indirect taxation(I_{hit}).

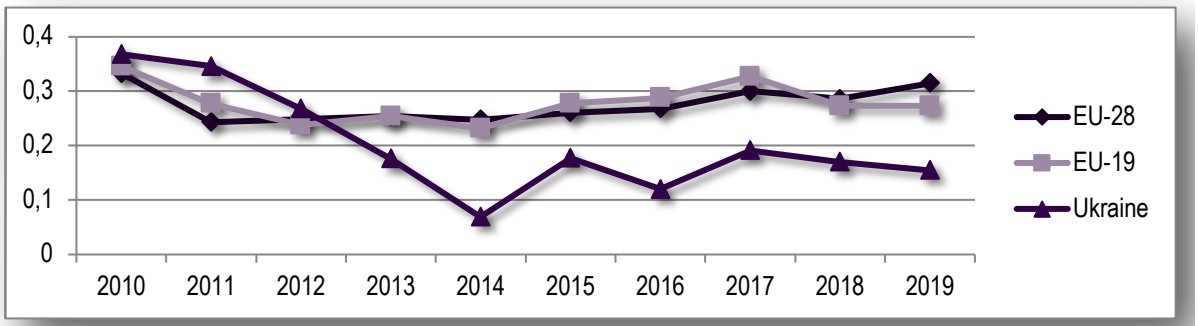
$$I_{hitk,i} = 1 - \frac{r_{i0}}{\frac{1}{n}\sum_{i=1}^{n} c_{ri0} + 2 \times \sqrt{\frac{1}{n}\sum \left(\frac{1}{n}\sum_{i=1}^{n} r_{i0}\right)^2}}$$

Source: Developed by the authors.

Figure 8. Results of taxonomic analysis of the level of indirect harmonization taxation in EU member states and Ukraine

Grouping of European countries by the level of the indicator I_{hit} in 2019

Level of harmonization of indirect taxation	Range of values I_{hit}	Composition of groups		Significance of indicators in the structure ('+' – high; '-' – low)		
		EU-28 ('old' EU member states)	EU-19 ('new' EU member states)	I_{VAT}	I_{Exc}^{e}	I_{Exc}^{ab}
Low	[0; 0.1)	–	Estonia (EE) (0.085)	–	+	+
Medium	[0.1; 0.3)	Austria (AT), Belgium (BE), Greece (EL), Luxembourg (LU), Finland (FI), Italy (IT), Ireland (IE), Netherlands (NL) (average value – 0.189)	Hungary (HU), Malta (MT), Serbia (SR), Romania (RO), Poland (PL), Slovakia (SK), Latvia (LV), Lithuania (LT) (average value – 0.222) Ukraine (0.155)	+	–	+
High	[0.3; 0.5)	France (FR), Portugal (PT), United Kingdom (UK) (average value – 0.409)	Cyprus (CY), Czech Republic (CZ) (average value – 0.432)	+	+	–
Very high	[0.5; 1)	Germany (GE), Denmark (DK), Spain (ES) (average value – 0.692)	Bulgaria (BG) (0.645)	+	+	+



Dynamics of the indicator level I_{hit}

Source: Developed by the authors.

The group of countries with an average level of the indicator I_{hit} includes the largest number of European countries, and the average value of this indicator within this group for the EU-28 is lower than for the EU-19. The difference between the extremes of the indicator I_{hit} was 0.651: from Estonia ($I_{hit} = 0.085$) to Spain ($I_{hit} = 0.736$). The value of the indicator I_{hit} for Ukraine was 0.155 (with a range of marginal changes $0 \leq I_{hit} \leq 10$), which identifies it as a country with a potentially average level of harmonization of indirect taxation, subject to accession to the EU. The obtained values of the indicator for Ukraine and most EU member states are largely due to the high level of harmonization of VAT and excise tax on alcoholic beverages and tobacco products, while energy taxation, despite all the requirements of EU institutions remains poorly harmonized. It can be argued that the current level of adaptation of tax legislation in Ukraine to EU requirements is close to the average level of harmonization of indirect taxation, which has developed today in most countries of the European Community.

Strengthening economic ties between Ukraine and European countries, the state's desire to join the EU in the future increase the relevance of taking into account the effects of tax competition in Ukrainian tax practice. To solve this problem, we have built an economic and mathematical model that allows to identify the impact on the probability of reducing the corporate income tax rate in Ukraine of certain factors of tax competition, namely: (1) the size of the country (population (*n*), GDP (*GDP*)); (2) participation in regional associations (*λ*); (3) capital mobility (foreign direct investment (F_{inv})); (4) openness of the country (export (*E*), import of goods and services (*I*)); (5) domestic policy in the field of direct taxation (full tax burden(*TR*), the share of corporate income tax in the tax burden (F_{KTP}), the rate of corporate income tax (R_{KTP}), the amount of income (profit (*P*), the ratio of offshore zones in the

country (*OZ*)); 6) fiscal policy of other countries (the coefficient of the impact of the corporate income tax rate set in other countries, taking into account the spatial weight of each of the countries (IR_{KTP})); 7) political factor (coefficient of frequency of elections) (*E*)); 8) other factors of socio-economic development (fixed capital investment (I_{fc}), consolidated budget deficit (surplus) (*Д*), unemployment rate (L_u), inflation index (I_{inf})). The functional dependence of the country's inclination (Ukraine, Austria, Bulgaria, Cyprus, France, Hungary, Latvia, Poland, Slovakia, Croatia) to reduce the corporate income tax rate *f(r)* in the period *t* on tax competition factors is calculated, which is described by a generalized linear model of binary choice with logistic distribution. For Ukraine, this dependence took the following form (Eq. 21):

$$f(r_i) = -13.63948 \times R_{KTP_{t-1}} - 6.24003 \times IR_{KTP_{t-1}} + 1.11259 \times n_{t-1} + 3.10323 \times GDP_{t-1} - \\ -0.00499 \times r_{t-1} + 1.83068 \times F_{inv_{t-1}} - 2.87008 \times E_{t-1} + 3.59278 \times I_{t-1} - 1.92037 \times TR_{t-1} - \\ -2.35633 \times F_{KTP_{t-1}} + 2.07137 \times P_{t-1} - 0.00284 \times OZ_{t-1} + 0.84012 \times E_{i,t-1} + 5.71438 \times \\ \times I_{fc_{t-1}} + 6.59282 \times D_{t-1} - 1.40294 \times L_{u_{t-1}} 2.36391 \times I_{inf_{t-1}} \quad - 21.85016. \qquad (21)$$

Based on the analysis of dependence (21) it was found that the most statistically significant variables are the tax rate, the amount of taxable income, the share of tax in the tax burden, the level of the full tax burden. Functional dependence (21) allowed confirming two hypotheses:

(1) Ukraine has a high level of corporate income tax rate (higher than the EU-28 and EU-19 in average), so it is more inclined to reduce the rate than European countries with a low level of this tax rate;

(2) Ukraine borders EU member states with low levels of corporate income tax rates, so it is more likely to reduce the national rate than the countries that are affected by high tax rates of neighboring countries.

Conclusions

Thus, the indicative development and the effective functioning of the fiscal system through appropriate stimulus and disincentive factors allows to create a favorable fiscal environment to ensure economic growth, improve the position of countries in international rankings. At the same time, the harmonization of Ukrainian legislation in the field of taxation with the legislation of EU member states provides the maximum space for the implementation of tax settlement mechanisms. We believe that shifting the vector of tax burden towards environmental and resource payments and consumption through the regulatory potential of the tax system, i.e. the use of objective, clear, simple and time-limited tax instruments should be an incentive for energy conservation, innovation and environmental management in countries. Stimulating business activity by paying the classic set of taxes and fees in the general taxation system, applying reduced rates and abandoning the simplified taxation system will adjust the fiscal mechanism of taxation, harmonize the specifics of tax partnerships of all entities and abandon the use of strict fiscal control.

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