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The Relationship Between Tax Revenue and Public Social Expenditure in the EU Member States

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Abstract:

Purpose: *The objective of this paper is to identify, with the use of statistical methods, the relationship between the level of fiscalism and the ratio of social expenditure to the total public expenditure in the EU-28.*
Design/Methodology/Approach: *Linear regression and correlation were used to assess the interdependence between the tax revenue-to-GDP ratio and the ratio of social expenditure to the total public expenditure in the EU-28. Then, using the direction of the slope as the criterion, the EU 28 were classified into countries with a positive relationship (the lower and upper border of the confidence interval are positive) and countries with a negative relationship (the lower and upper border of the confidence interval are negative).*
Findings: *The research confirmed that the EU Member States with a high level of fiscalism in 2004-2018, in principle, were characterised by the following interdependence: the higher the tax revenue-to-GDP ratio was, the higher the ratio of social expenditure to the total public expenditure was. After the decomposition of public expenditure, a similar relationship was identified for public expenditure on social protection, while no such relationship was identified for other categories of expenditure for social purposes.*
Practical Implications: *The research results are important as the EU-28 are striving to maintain fiscal stability. The research findings point to the need of verifying the tasks in the field of social protection in countries with a high level of fiscalism. Increasing these tasks, mean a further increase in the tax burden on the economy.*
Originality/Value: *The research adds value to the testing of the fiscal-synchronization hypothesis. The originality of the research mainly results from its detailed nature. The relationship between the level of fiscalism and public expenditure was identified not in general terms but incurred for tasks related to the implementation of social policy in the individual EU-28.*

Keywords: *Tax revenue, public expenditure, social expenditure, fiscal policy.*

JEL: *H3, H7.*

Paper Type: *Research Paper*

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1. Introduction

Today, as it has been for centuries, the tax is the basic instrument for collecting public revenue, thus it serves to meet the demand for money expressed by the state. Assuming that the primary goal of a tax is a fiscal goal, both individual taxes and all taxes applied in a given country should be fiscally efficient (Famulska *et al.,* 2019). The size of the state's income needs is determined by the tasks it carries out in a given place and time. These tasks, in turn, differ depending on the socio-economic doctrine adopted and implemented in individual countries. It is obvious that the greater the scope of tasks is, the greater state's need for financial resources is, and, in particular, for tax revenue. As a consequence, the level of fiscalism varies in the world, which is confirmed by numerous studies. The level of fiscalism can be expressed, *inter alia*, by the so-called fiscalism index, i.e. the tax revenue-to-GDP ratio. Comparative analyses of this indicator for OECD countries in 1986-2018, carried out by Owsiak (2019), show that this indicator fluctuated in a large range, i.e. from about 20% (e.g. Mexico) up to more than 50% (e.g. Norway).

Not only is the financial dimension of tasks performed by the state reflected on the public revenue side, mainly the tax revenue, but also on the public expenditure side. Research on public revenue allows, as a rule, for the formulation of general assessments concerning the scale of tasks performed by the state. Research on public expenditure, on the other hand, allows for both general and specific conclusions. Cross-section analyses of public expenditure connected with the state functions provide the basis for assessing the scale of state involvement in specific tasks. An example of comparative research on the structure of public expenditure is the analysis carried out by Postuła (2019) for the Member States of the European Union for the period of 1995-2016.

The analysis of the state of knowledge carried out by the authors on the issue of public revenue, including tax revenue, and public expenditure, in connection with the functions of the state, leads to the conclusion that the subject of the research to date is mainly:

- public revenue, including tax revenue, with regard to the functions of the state in general terms,
- public expenditure with regard to the functions of the state in general and detailed terms,
- public revenue with regard to public expenditure in general terms.

However, there is a lack of in-depth research on the level of fiscalism with regard to specific public expenditure incurred in connection with the implementation of specific state tasks. Considering the identified research gap, this paper focuses on the relationship between fiscalism and expenditure on tasks resulting from the social policy pursued by the state. A high level of fiscalism is most often attributed to

extensive benefits for society in the field of health protection, education, social protection.

The objective of the paper is to identify the relationship between the level of fiscalism and the ratio of the total public social expenditure in the EU Member States. The study verified the following research hypothesis: the greater the tax revenue-to-GDP ratio is, the greater the ratio of social expenditure to the total public expenditure is. The research procedure adhered to the analysis of the expenditure for social purposes in general, i.e., including both expenditure on social goods and transfers under social assistance. Detailed analyses were also carried out by decomposing the expenditure into categories consistent with the COFOG classification. The research covered the Member States of the European Union on the basis of data for the years 2004-2018. The starting year of 2004 adopted for the research period is justified by the fact that this year saw a significant enlargement of the European Union. 2018 is the last year for which complete data sets are available.

2. Theoretical Background

Currently, the influence of the state over the socio-economic situation through fiscal interventions is considered to be one of the most important research issues undertaken in the area of public finances. The last financial crisis and its negative impact on the fiscal situation of many countries resulted in stepping up research, both in theoretical and empirical layers (Ramey, 2019).

Although the contemporary tasks of the state in the market economy come down to three functions: allocation, stabilisation and redistribution, the state mainly focuses on the last function mentioned, implemented by the fiscal policy, more specifically through the tax policy and the public social expenditure policy. This function is reflected in the active role of the state and concerns the fair distribution of GDP to society. State interference in this respect allows for the reduction of social disparities (Bywalec, 2007). Thus, managing the revenue and expenditure of the state budget allows for the implementation of fiscal policy objectives of both social and economic nature, such as:

- ensuring an efficiently functioning state budget, balanced in the long term,
- financing an adequate supply of goods of a public and social nature,
- stabilising economic development (i.e. influencing the economic situation and price stability),
- fostering social development of households,
- ensuring a dignified living for the elderly, the sick and the unemployed (Bajohr, 2003).

The growing state interference in social and economic processes is reflected in the growing fiscalism, i.e. tax policy, which directly (direct taxes) or indirectly (indirect

taxes) affects the level of people's income (Bywalec, 2007). The basic measures of fiscalism include:

- the level of the fiscal burden in relation to GDP,
- the extent of the public finance system interference in GDP,
- the coverage of public expenditure with public revenue,
- the tax rate levels,
- the composition of tax scales
- differences between nominal and effective tax rates (Dynus, 2007).

In the literature, Owsiak divided fiscalism into rational and excessive. In the author's opinion, rational fiscalism occurs when the scale of public authorities 'interference in taxpayers' income allows for satisfying the consumption needs of households as well as the functioning and development of economic entities. This contributes to sustained economic growth and meets the moderate revenue needs of public authorities. On the other hand, excessive fiscalism is associated with a number of negative consequences, including: slower pace of economic growth and social development, decline in competitiveness, difficulties in solving socio-economic problems and the development of the informal economy (Owsiak, 2017).

The degree of fiscalism in the Member States of the European Union was studied by Dynus (2007). The author pointed to difficulties in listing countries with a high level of fiscalism, due to the diversity of individual economies and the lack of a clear border between rational and excessive fiscalism. In her opinion, the assessment of the degree of fiscalism of a given economy is easier when using standardised measures. The impact of excessive fiscalism on the increase in the size of the informal economy was studied by Dziemianowicz (2009). Bednarski *et al.* (2008) analysed the main drivers for the informal economy, such as tax burdens and collecting social security contributions. Pasternak-Malicka (2015) studied the impact of taxes on the fairness of entrepreneurs in relation to tax obligations.

Another area of research within the implemented fiscal policy of the state is the shaping of the amount and structure of public expenditure. The expenditure is an important instrument for the implementation of political, economic, and social tasks. The amount of public expenditure depends on the current economic situation. Public expenditure is used to shape economic growth and reduce social inequalities in an active way. Increasing public expenditure implies increasing public revenue and thus may result in or increase of the budget deficit. Under budgetary imbalance or limited economic growth, increasing the budget deficit is not a desirable situation.

On the one hand, state expenditure is an important element of the economic stabilisation of the state and the development of society. On the other, this expenditure poses a serious problem for many countries. Due to the rapid and steady growth, spending increases the public debt. According to Keynes, public expenditure should

stabilise the economy, favour anti-cyclicality and counteract negative consequences for the economy (Szarowska, 2013). Serven (1998) argued that pro-cyclical fiscal policy is considered to be detrimental to the welfare of the society, as it may foster macroeconomic destabilisation, lower the level of investments in the country, slow down economic growth, and thus may contribute to a decline in the wealth of the society. The author links fiscal policy with the business cycle, thus he believes that an expansionary fiscal policy in periods of constant economic growth, not fully compensated during the crisis, contributes to an increase in the country's debt and ultimately insolvency.

Further, Serven (2008) argued that countries applying countercyclical fiscal policy tools reduce state expenditure in times of economic prosperity and proportionally increase expenditure in times of crisis in order to optimise fiscal policy. The pro-cyclicality of state expenditure was also studied by Hercowitz and Strawczyński (2004), Kaminsky *et al.*, (2004), Alesina *et al.*, (2008), Rajkumar and Swaroop (2008), Ganelli (2010) and Szarowska (2012). Talvi and Vegh (2005) emphasised that expansionary fiscal policy dominates in the most developed countries. Lane (2003) argued that the level of public expenditure differs in OECD countries depending on the category of this expenditure. Abbott and Jones (2011) tested the cyclicality of public expenditure in connection with the functions of the state in general and detailed terms in 20 OECD countries.

Effective impact on the economy through public expenditure requires analysing not only the cyclicality, structure, efficiency, and effectiveness of the expenditure, but also the structure of taxes and budget constraints. Empirical research proves that all these factors are interrelated and interact with each other (Owsiak, 2017). The literature often analyses the impact of the size of the public finance sector, measured by the size of public expenditure in relation to GDP, on economic growth, labour market, and private investment. Research acknowledges that both reducing and increasing public spending may have negative effects on the economy. For example, Afonso and Furceri (2008) found that most of the European Union countries are characterised by an excessively high level of expenditure, which often exceeds the breaking point.

On the other hand, insufficient public expenditure does not allow for the provision of the necessary institutional structure and infrastructure. The public expenditure is insufficient to ensure order and security of the society and hampers economic development. Groneck (2011) encouraged an extensive study of public expenditure that influences the economic growth of the state and, consequently, the welfare level of the society. To determine the optimal amount of public expenditure, it is necessary to determine its structure. The shaping of the expenditure structure is limited due to the rigid nature of social and administrative spending (Budzyński, 2014). Additionally, allocation decisions concerning public expenditure are characterised by diversified time horizon (Postuła, 2014).

Thanks to the introduction of a standardised Classification of the Functions of Government (CO-FOG), Ferreiro, Garcia-Del-Valle and Gomez (2013) had the opportunity to prove that the amount and functional structure of public expenditure varies significantly in the EU Member States. Sawulski (2016) also confirmed that public expenditure in conjunction with the functions of the state in the countries of Central and Eastern Europe shows significant differentiation.

The literature also tests dependencies between public expenditure and tax revenue in general. Four main hypotheses are verified in the research (Table 1):

Hypothesis 1: Tax revenue influences public expenditure (tax-spend hypothesis).
Hypothesis 2: Public expenditure affects tax revenue (spend-tax hypothesis).
Hypothesis 3: Tax revenue and public expenditure influence each other (fiscal-synchronization hypothesis).
Hypothesis 4: Tax revenue and public expenditure do not influence each other (institutional separation hypothesis).

For example, Friedman (1978) argued that an increase in tax revenue contributes to an increase in public expenditure. As a consequence, the increase in public expenditure leads to an increase in economic activity in the country. On the other hand, the author emphasises that tax cuts increase interest in public projects and thus increase public expenditure. In turn, Buchan and Wagner (1978) confirmed that an increase in tax revenue causes a decrease in public expenditure due to the presence of a fiscal illusion. The relationship regarding the impact of tax revenue on the amount of public expenditure was also investigated by Marlow and Manage (1988), Ram (1988), Chowdhury (1988), Holtz-Eakin (1989), Joulfaian and Mookerjee (1990), Koren and Stiassny (1998), Chang, Liu and Caudill (2002), Chang (2009).

Barro (1974) emphasised that an increase in public expenditure contributes to a constant increase in tax revenue. Peacock and Wiseman (1979) argued that short-term increases in public spending lead to constant increases in tax revenue. The impact of public expenditure on the amount of tax revenue was analysed by the following authors: Zapf and Payne (2009), Lusinyan and Thornton (2012), Bunescu and Comaniciu (2014).

Musgrave (1966), Meltzer and Richard (1981) held the view that public expenditure and tax revenue were determined simultaneously. This means that the government sets a desired level of public expenditure that it can finance from the accumulated tax revenue in a specific budget year. Similar conclusions were presented in the works of Ahmed and Rogers (1995), Quintos (1995), and Hasan and Lincoln (1997).

Wildavsky (1988), Hoover and Sheffrin (1992), Baghestani and McNown (1994) as well as Ewing, Payne, Al-Zoubi and Thompson (2006) confirmed that, in general, public spending is not correlated with the state's tax revenue.

Table 1. *Dependencies between public expenditure and tax revenue – main research hypotheses, literature review*

Hipothesis	*Authors*	*Year*	*Journal*	*Title*
The tax-spend hipothesis	Chang T.	2009	Czech Journal of Economics and Finance	Revisiting the Government Revenue-Expenditure Nexus: Evidence from 15 OECD Countries based on the Panel Data Approach.
	Friedman M.	2003	Policy Review	The limitations of tax limitation
	Chang, T., Liu, W. R. and Caudill, S. B.	2002	Applied Economics	Tax-and-spend, spend-and-tax, or fiscal synchronization: new evidence for ten countries
	Koren S., Stiassny A.	1998	Journal of Policy Modeling	Tax and spend, or spend and tax? An international study
	Joulfaian D., Mookerjee R.	1990	Public Finance	The intertemporal relationship between state and local government revenues and expenditures: evidence from OECD countries
	Holtz-Eakin D. F.	1989	International Economic Review	The revenues-expenditures nexus: evidence from local government data
	Chowdhury A. R.	1988	Public Choice	Expenditures and receipts in state and local government finances: comment
	Ram R.	1988	Public Finance	A multicountry perspective on causality between government revenue and government expenditure
	Marlow M. L., Manage N.	1987	Public Choice	Expenditures and receipts: testing for causality in state and local government finances
	Buchanan J. M., Wagner R. E.	1977	Academic Press, New York	Democracy in Deficit: The Political Legacy of Lord Keynes
The spend-tax hipothesis	Bunescu L., Comaniciu C.	2014	Studies in Business and Economics	Analysis of correlation between tax revenues and other exonomix indicators in European Union Member States
	Lusinyan L., Thornton J.	2012	Applied Economics	The intertemporal relation between government revenue andexpenditure in the United Kingdom, 1750 to 2004
	Zapf M, Payne E. J	2009	Applied Economics Letters	Asymmetric modelling of the revenue-expenditure nexus: evidence from aggregate state and local government in the US
	Kollias C. and Makrydakis S. V.	2000	Applied Economics	Tax and Spend or Spend and Tax? Empirical Evidence from Greece, Spain, Portugal and Ireland
	Joulfaian D., Mookerjee R.	1991	Applied Economics	Dynamics of government revenues and expenditures in industrial economies
	Barro R. J.	1979	Journal of Political Economy	On the determination of government debt
	Peacock A. T., Wiseman J.	1979	Princeton University Press, Princeton, NJ	The Growth of Public Expenditure in the United Kingdom
The fiscal-synchronization hipothesis	Hasan M., Lincoln I.	1997	Applied Economics Letters	Tax then spend or spend then tax? Experience in the UK
	Ahmed S., Rogers J. H.	1995	Journal of Monetary Economics	Government budget deficits and trade deficits: are present value constraints satisfied in long-term data?
	Quintos C. E.	1995	Journal of Business and Economic Statistics	Sustainability of the deficit process with structural shifts
	Meltzer A. H., Richard S. F.	1981	Journal of Political Economy	A rational theory of the size of government
	Musgrave R.	1966	Random House, New York	Principles of budget determination, in Public Finance: Selected Readings
The institutional separation hipothesis	Ewing B. T., Payne J. E., Al-Zoubi O. M.	2006	Southern Economic Journal	Government expenditures and revenues: evidence asymmetric modeling
	Baghestani H., McNown R.	1994	Southern Economic Journal	Do revenues or expenditures respond to budgetary disequilibria?
	Hoover i Sheffrin	1992	*American Economic Review*	Causation Spending and Taxes: Sand in the Sandbox or Tax Collector for the Welfare State?
	Wildavsky A.	1988	Scott, Foresman, Glenview, IL.	The New Politics of the Budgetary Process

Source: *Own study.*

Jones and Joulfaian (1991), Provopoulos and Zambaras (1991), Vamvoukas (1997), Darrat (1988; 1998), Payne (1998), Aka and Decaluwé (1999), Kollias and Makrydakis (2000), Chang and Ho (2002) also conducted research in terms of the four hypotheses mentioned, and their results, depending on the research period adopted, were different.

3. Research Sample

The study used data from the Eurostat database on the total tax revenue and GDP, on the basis of which the a measure – the tax revenue-to-GDP ratio – was calculated to identify the level of fiscalism in the European Union Member States (Table 2). The study was carried out for 28 European Union Member States for the period of 2004-2018.

First, a measure ***a*** was analysed in terms of minimum values, maximum values, and its average level. The lowest tax revenue-to-GDP ratio, at 23.0%, was in Ireland in 2018. The highest level of this measure was at 49.9% in Denmark in 2014. In 2004-2018, the lowest average tax revenue-to-GDP ratio of 27.6% was recorded in Romania. The respectively highest level of this measure, amounting to 47.2%, was recorded in Denmark (Table 2).

Table 2. *Characteristics of the EU Member States broken down by the **a** measure in 2004-2018*

Region/State	*QnT*	a_{sorted}			
		a_m	a_{max}	a_{min}	a_x
EU28	NC	39.32	40.30	38.40	1.70
Romania		27.61	25.80	27.61	-1.00
Ireland		28.41	23.00	28.41	-7.90
Bulgaria		28.88	25.40	28.88	-1.50
Lithuania		29.29	27.20	29.29	1.20
Latvia		29.37	27.90	29.37	3.50
Slovakia		30.95	28.30	30.95	2.50
Estonia	Q1T	32.14	29.90	32.14	1.90
Cyprus		32.61	29.50	32.61	4.30
Malta		33.08	31.50	33.08	1.20
Poland		33.78	32.10	33.78	3.20
Czechia		34.20	32.30	34.20	1.50
Spain		34.30	30.60	34.30	0.50
United Kingdom		34.63	33.60	34.63	0.90
Portugal	Q2T	35.39	33.30	35.39	3.70
Greece		36.62	32.10	36.62	9.40
Croatia		36.77	35.20	36.77	2.20
Netherlands		36.90	35.60	36.90	3.60
Slovenia		38.13	37.60	38.13	-0.80
Hungary		38.27	36.60	38.27	0.50
Luxembourg		38.83	37.10	38.83	3.20
Germany	Q3T	39.77	38.80	39.77	2.50
Italy		41.73	39.10	41.73	2.80
Finland		42.34	40.70	42.34	0.50
Austria		42.53	41.50	42.53	-0.50
Sweden		44.47	42.60	44.47	-1.90
France		46.01	44.10	46.01	4.30
Belgium		46.73	45.50	46.73	1.10
Denmark	Q4T	47.19	45.30	47.19	-2.60

a - main national accounts tax aggregates as a percentage of GDP (%); m - mean level (%); max - maximum level (%); min - minumum level (%); x - change of level from 2004 to 2018 (p.p.); QnT - quartile n in terms of main national accounts tax aggregates as a percentage of GDP; NC - not classfied

Source: *Own study.*

Then, absolute changes in the value of the measure ***a*** were analysed by comparing its values between the end and the beginning of the analysed period. These changes were given in percentage points (pp). Over the analysed period, the largest increase in the tax revenue-to-GDP ratio, by 9.4 pp, was recorded in Greece. On the other hand, the largest decline in this measure, by 7.9 pp, was recorded in Ireland (Table 2).

The measure ***a*** was ranked according to the criterion of its average level in the years 2004-2018, in order from the lowest to the highest values. On this basis, 4 measures ***a*** of observation position (four quartiles) were determined, to which the EU-28 were assigned. Ultimately, it allowed for the identification of four quartiles – each containing seven countries (Table 2). The first quartile (Q1) proves that 25% of the

population units have average values of a measure less than or equal to the first Q1 quartile, and 75% equal to or greater than this quartile. The second quartile divides the set of observations into half. The third quartile divides the set of observations into two parts, 75% of the population units have average a1 values less than or equal to the third quartile Q3, and 25% equal to or greater than this quartile, respectively (Table 2).

The study also includes data from the Eurostat database on individual groups of public expenditure in the EU Member States. For this purpose, the expenditure was broken down into categories consistent with COFOG (Table 3). Thanks to the introduction of a standardised Classification of the Functions of Government (COFOG) in international statistics, it is possible to combine a rigid structure of budgetary expenditure with the implementation of specific state goals. COFOG was introduced in 1999 by the Organization for Economic Cooperation and Development (OECD) and published by the United Nations Statistical Division as an international standard for measuring state activity. It is one of the four commonly used classifications of public expenditure in national accounts. This classification is made in the system of functions, groups, and subgroups, along with an indication of objectives set for functions that are planned to be achieved. It divides public expenditure into the following functions:

- CF01: General public services,
- CF02: Defence,
- CF03: Public order and safety,
- CF04: Economic affairs,
- CF05: Environmental protection,
- CF06: Housing and community amenities,
- CF07: Health,
- CF08: Recreation, culture, and religion,
- CF09: Education,
- CF10: Social protection (OECD, 2019).

The study analysed social expenditure included in COFOG broken down by the following functions: CF06, CF07, CF08, CF09, CF10.

4. Research Methodology

The objective of the research is to identify the relationship between the tax revenue-to-GDP ratio and the ratio of social expenditure to the total public expenditure in the European Union Member States. Linear regression and correlation were used to assess the interdependence (Aczel and Sounderpandian, 2009). Based on the data for 2004-2018, the regression slope (b1) and the regression intercept (b0) were calculated. The 95% confidence interval is indicated for the slope and intersection point. Then, using the direction of the slope as a criterion, the EU 28 were classified into countries with

a positive relationship (+), for which the lower and upper borders of the confidence interval are positive, and countries with a negative relationship (-), for which the confidence interval is negative. Countries for which the lower and upper borders did not have the same direction were considered to have an ambiguous relationship (±).

Table 3. *Average ratios of individual categories of public expenditure according to COFOG to total expenditure in EU 28 in 2004-2018*

Region/State	$CF01_m$	$CF02_m$	$CF03_m$	$CF04_m$	$CF05_m$	$CF06_m$	$CF07_m$	$CF08_m$	$CF09_m$	$CF10_m$	$CF06\text{-}10_m$	$CF06\text{-}09_m$
EU28	13.77	2.99	3.74	9.31	1.70	1.60	14.73	2.38	10.45	39.31	68.48	29.16
Belgium	16.11	1.78	3.34	12.52	2.21	0.72	14.18	2.41	11.42	35.30	64.03	28.74
Bulgaria	11.91	3.67	6.96	14.25	2.19	3.31	12.66	2.36	10.07	32.61	61.01	28.40
Czechia	10.99	2.32	4.47	15.22	2.37	2.17	17.70	3.37	11.52	29.86	64.62	34.76
Denmark	13.61	2.47	1.83	6.23	0.87	0.54	15.30	3.24	12.45	43.47	75.00	31.53
Germany	13.95	2.19	3.43	7.96	1.25	1.33	15.19	2.39	9.23	43.12	71.26	28.14
Estonia	9.52	4.54	5.45	11.99	1.73	1.03	12.87	5.62	15.97	31.28	66.77	35.49
Ireland	12.06	1.03	3.78	11.99	1.93	2.55	17.56	1.87	11.42	35.83	69.24	33.40
Greece	21.00	5.11	3.58	11.01	2.07	0.50	11.36	1.31	8.03	36.03	57.23	21.20
Spain	13.61	2.32	4.55	11.95	2.23	1.64	14.21	3.16	9.74	36.62	65.37	28.75
France	12.31	3.23	2.89	9.16	1.73	2.18	14.21	2.64	9.84	41.85	70.72	28.87
Croatia	12.63	2.92	5.09	16.89	1.64	6.01	10.10	3.84	8.84	32.03	60.83	28.80
Italy	18.45	2.60	3.79	8.36	1.67	1.22	14.26	1.44	8.54	39.63	65.10	25.47
Cyprus	21.19	4.38	4.67	10.61	0.69	5.15	6.84	2.50	14.32	29.65	58.46	28.81
Latvia	11.55	3.38	5.65	15.56	1.63	3.11	10.40	4.20	15.42	29.12	62.24	33.12
Lithuania	12.39	3.71	4.69	11.17	1.83	0.94	15.63	2.68	14.84	32.13	66.22	34.09
Luxembourg	11.96	0.80	2.41	12.34	2.43	1.58	11.34	2.95	11.82	42.40	70.09	27.69
Hungary	18.79	2.01	4.10	14.02	1.40	1.75	10.34	4.18	10.79	32.61	59.66	27.06
Malta	16.76	1.77	3.33	12.43	3.53	1.16	13.65	2.09	13.36	31.94	62.19	30.26
Netherlands	11.90	2.74	4.20	9.73	3.37	1.09	16.25	3.04	11.82	35.87	68.08	32.20
Austria	13.99	1.31	2.65	12.69	0.90	0.72	15.23	2.51	9.61	40.38	68.46	28.07
Poland	12.37	3.78	5.18	11.63	1.39	1.88	10.83	2.80	12.57	37.59	65.67	28.08
Portugal	16.61	2.48	3.97	9.86	1.33	1.21	14.48	2.19	12.07	35.82	65.76	29.95
Romania	12.23	4.17	5.97	17.52	1.72	3.68	10.78	2.73	9.55	31.67	58.41	26.74
Slovenia	12.29	2.48	3.60	11.33	1.58	1.31	13.79	3.28	12.75	37.55	68.69	31.14
Slovakia	12.21	2.17	5.70	12.62	2.10	1.52	16.73	2.29	9.74	34.91	65.18	30.27
Finland	14.49	2.68	2.41	8.90	0.51	0.71	13.53	2.38	11.65	42.76	71.02	28.27
Sweden	14.74	2.79	2.58	8.43	0.92	1.13	13.29	2.51	12.92	40.68	70.53	29.85
United Kingdom	10.69	5.15	4.99	7.48	1.98	2.14	16.64	1.90	12.84	36.17	69.69	33.52
m - mean level (%)												

Source: *Own study.*

Countries with a positive (negative) relationship, in other words, countries for which it can be stated with 95% confidence that the higher the tax revenue-to-GDP ratio is, the higher (lower) the ratio of a given expenditure or group of expenditure to the total expenditure is. The linear relationship was confirmed using the F-test for a 5% significance level. Countries classified as positive or negative are also countries for which the F test confirmed the linear relationship (p value was appropriately low).

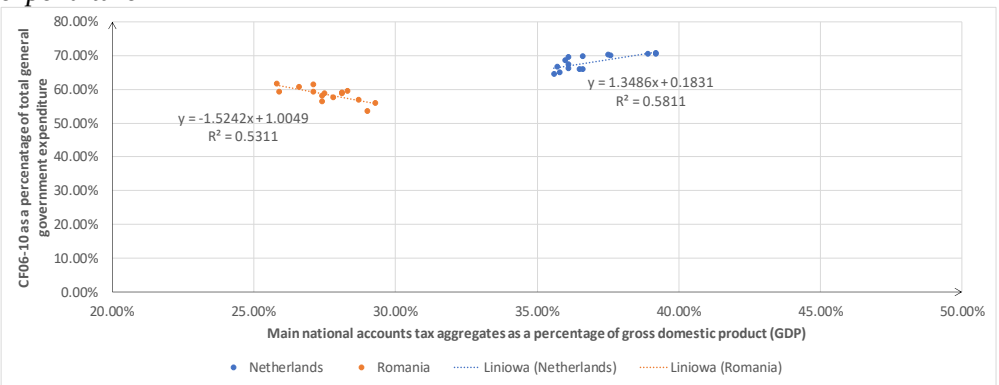
Furthermore, the Pearson's linear correlation coefficient (ρ) and the coefficient of determination (r^2) were calculated. The coefficient of determination was used to assess the extent to which the variation in the ratio of a given expenditure or group of expenditure items to the total expenditure is explained by the tax revenue-to-GDP

ratio. Within individual expenditure items or groups of expenditure, the coefficient of determination made it possible to identify countries with the strongest positive interdependence and the strongest negative interdependence.

5. Research Results and Discussion

First, the interdependency between the tax revenue-to-GDP ratio and the ratio of the total expenditure on: housing and community amenities, health, recreation, culture and religion, education and social protection (CF06-10) to the total expenditure was considered (Table 4). Among the countries with a positive relationship, the following were identified: the Netherlands (the strongest), France, Finland, Croatia, Italy and Germany (the weakest). All these countries belonged to the 3rd or 4th quartile of countries with the highest average tax revenue-to-GDP ratio in the period under consideration. In the case of the Netherlands, the tax revenue-to-GDP ratio explained the changes in the ratio of CF06-10 expenditure to the total expenditure at 58.11% (**Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.**).

Figure 1. *Countries with the strongest positive and negative correlation between the tax revenue-to-GDP ratio and the ratio of CF06-10 expenditure to the total expenditure*



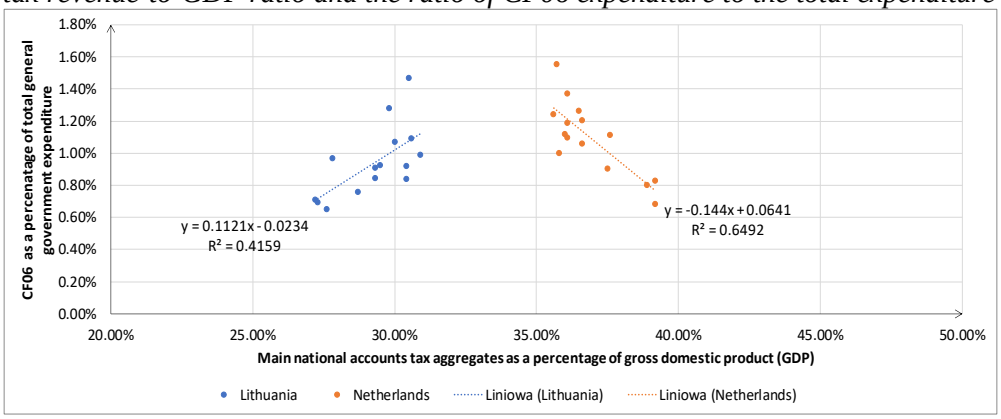
Source: *Own study based on Eurostat data: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10a_exp&lang=en, https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10a_taxag&lang=en. (retrieved: 30.06.2020).*

It should be noted that in the Netherlands in the period under consideration, the tax revenue-to-GDP ratio increased from 35.60% to 39.20%, which was accompanied by an increase in the ratio of CF6-10 expenditure to the total expenditure from 64.49% to 70.46 %. It should be emphasised that in the case of Germany and Italy, the regression relationship explained the changes in the ratio of CF06-10 expenditure in less than 50%. A negative correlation was found in the case of Romania (the strongest), Great Britain and Slovakia (the weakest). The identified countries with the negative correlation belonged to the 1st or 2nd quartile of countries classified according to the criterion of the average tax revenue-to-GDP ratio. In the case of

Romania, the tax revenue-to-GDP ratio explained the changes in the ratio of CF06-10 expenditure to the total expenditure at 53.11% (Figure 1). It should be noted that in Romania the level of fiscalism did not change significantly over the period considered. The tax revenue-to-GDP ratio fell from 28.10% to 27.10%. At the same time, the ratio of CF06-10 expenditure to the total expenditure increased from 58.87% to 61.33%. In the remaining countries, the regression relationship explained the changes in the ratio of CF06-10 expenditure in less than 50%.

More generally, the results obtained positively verify the adopted research hypothesis for countries with a high level of fiscalism, assuming that the greater the tax revenue-to-GDP ratio is, the greater the ratio of social expenditure to the total public expenditure is. In six out of 14 countries classified into the 3rd or 4th quartile, a positive correlation was identified according to the level of fiscalism, while none of these quartiles had a negative correlation. It should be emphasised that the EU 28 were also characterised by a positive relationship. This relationship was identified for the total social expenditure. Taking into account the diversified nature of public expenditure in this area, in accordance with the adopted research methodology, the correlation between the ratio of particular types of expenditure to the total expenditure and the tax revenue-to-GDP ratio was assessed. In the case of expenditure on housing and community amenities (CF06) (Table 5), a positive relationship was identified in Lithuania (the strongest) and Ireland (the weakest). Both countries belonged to the 1st quartile of countries classified according to the average tax revenue-to-GDP ratio. In Lithuania, changes in the ratio of CF06 expenditure to the total expenditure were explained in the analysed period by the tax revenue-to-GDP ratio in 41.59% (Figure 2).

Figure 2. *Countries with the strongest positive and negative correlation between the tax revenue-to-GDP ratio and the ratio of CF06 expenditure to the total expenditure*



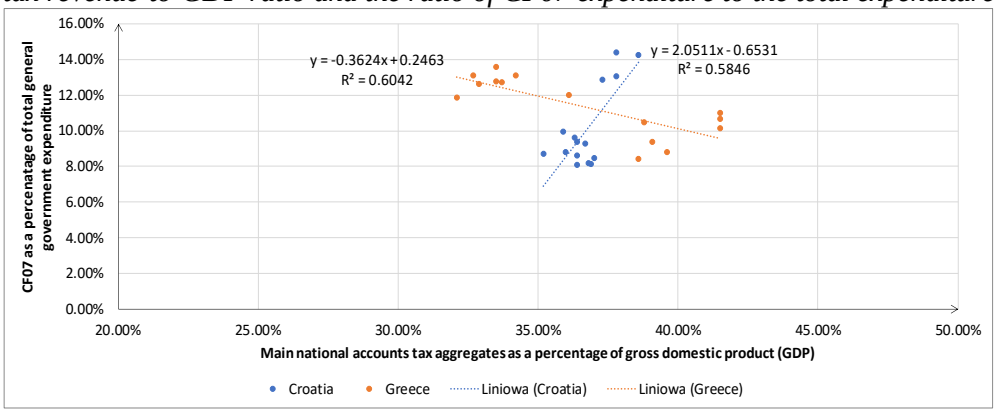
Source: *Own study as in Figure 1.*

The linear correlation in this case was average, close to weak. The tax revenue-to-GDP ratio in that time increased in Lithuania from 29.30% to 30.50%. The increase in fiscal burdens was accompanied by an increase in the ratio of CF06 expenditure to

the total expenditure from 0.84% to 1.47%. A negative correlation was confirmed for 10 countries, including: the Netherlands (the strongest), Slovakia, Belgium, France, Portugal, Germany, Greece, Finland, Croatia, and Italy (the weakest). Most of the identified countries belonged to the 3rd or 4th quartile of countries broken down by the level of fiscalism. In the Netherlands, changes in the tax revenue-to-GDP ratio explained the changes in the ratio of CF06 expenditure to the total expenditure in the analysed period at 64.92% (Figure 2). The increase in the fiscal burden in the Netherlands was accompanied by a decrease in the ratio of CF06 expenditure to the total expenditure from 1.24% to 0.83%. It should be noted that the regression relationship explained the changes in the ratio of the expenditure under consideration to a degree exceeding 60% in Slovakia only. In the remaining eight countries indicated – at less than 50%.

More generally, on the basis of the obtained results, it can be concluded that greater tax revenue-to-GDP ratio did not correspond to greater ratio of CF06 expenditure to the total public expenditure. In the case of eight countries out of 14 classified into the 3rd or 4th quartile of countries divided according to the level of fiscalism, a negative correlation was identified, while there was not a positive correlation in any of these quartiles. Another type of expenditure subject to individual assessment was expenditure on health (CF07) (Table 6). A positive correlation was found in three countries: Croatia (the strongest), Germany and the Netherlands (the weakest). All countries belonged to the 3rd quartile of countries broken down by the average tax revenue-to-GDP ratio. In Croatia, the tax revenue-to-GDP ratio explained the changes in the ratio of CF07 expenditure to the total expenditure at 58.46% (Figure 3).

Figure 3. *Countries with the strongest positive and negative correlation between the tax revenue-to-GDP ratio and the ratio of CF07 expenditure to the total expenditure*



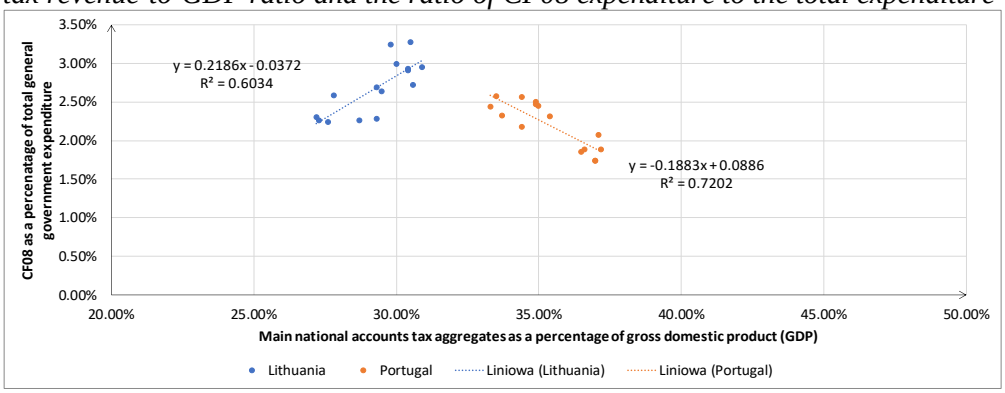
Source: *Own study as in Figure 1.*

The increase in the tax revenue-to-GDP ratio in Croatia was accompanied by a significant increase in the ratio of CF07 expenditure to the total expenditure, which increased from 8.06% to 14.26%. It should be stated that in the Netherlands the coefficient of determination did not exceed 50%. Countries with negative dependence

included: Greece (the strongest), Sweden, Portugal, Hungary, Romania, and Finland (the weakest). Changes in the ratio of CF07 expenditure to the total expenditure were explained in Greece at 60.42% by the fiscal burden on the economy (Figure 3). Greece significantly increased the level of fiscalism in the period in question. The tax revenue-to-GDP ratio increased from 32.10% to 41.50%, at the same time the ratio of CF07 expenditure to the total expenditure decreased from 11.83% to 10.63%. The coefficient of determination also exceeded 50% in the case of Sweden and Portugal. More generally, the obtained results do not provide grounds for formulating clear conclusions regarding the relationship between the level of fiscalism and the ratio of CF07 expenditure to the total public expenditure. These relations vary across the EU Member States. Considering the countries included in the 3rd or 4th broken down by the level of fiscalism, in three of them there was a positive relationship, and in four – a negative one.

Next, the correlation between the tax revenue-to-GDP ratio and expenditure on recreation, culture, and religion (CF08) was assessed (Table 7). A positive correlation was found in the case of Lithuania (the strongest) and Finland (the weakest). It is worth noting that Lithuania was classified in the 1st quartile of countries broken down by the average tax revenue-to-GDP ratio, while Finland – in the 4th quartile. The tax revenue ratio in Lithuania explained the changes in the ratio of CF08 expenditure to the total expenditure at 60.34 % (Figure 4).

Figure 4. *Countries with the strongest positive and negative correlation between the tax revenue-to-GDP ratio and the ratio of CF08 expenditure to the total expenditure*



Source: *Own study as in Figure 1.*

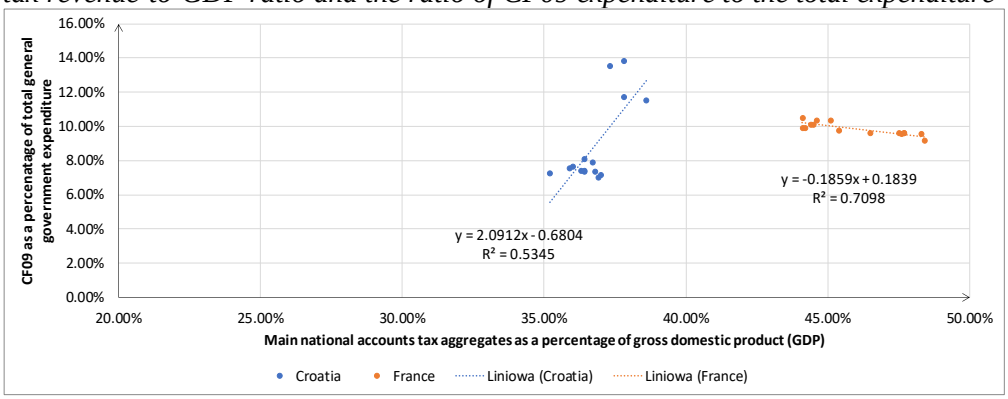
In the analysed period, the increase in the fiscal burden on the economy was accompanied by an increase in the ratio of CF08 expenditure from 2.28% to 3.27% in Lithuania. In the case of Finland, the regression relationship explained the changes in the ratio of the expenditure under consideration at less than 50%. The negative correlation was confirmed in the case of nine countries: Portugal (the strongest), Sweden, the Netherlands, Belgium, Estonia, Croatia, Austria, Italy, and Germany (the weakest). Most of these countries belonged to the 3rd and 4th quartile of countries broken down by the criterion of the average tax revenue-to-GDP ratio in the analysed

period. In Portugal, the tax revenue-to-GDP ratio explained the changes in the ratio of CF08 expenditure to the total expenditure at 72.02% (Figure 4). Portugal increased the fiscal burden on the economy over the period under consideration. The tax revenue-to-GDP ratio increased from 33.50% to 37.20%, while the ratio of CF08 expenditure to the total expenditure decreased from 2.57% to 1.88%. The regression relationship explained the changes in the ratio of CF08 expenditure also in Sweden, the Netherlands and Belgium to a significant degree.

More generally, on the basis of the results obtained, it can be concluded that a greater tax revenue-to-GDP ratio did not correspond to a greater ratio of CF08 expenditure to the total public expenditure. In the case of seven countries out of 14 classified into the 3rd or 4th quartile of countries broken down by the level of fiscalism, a negative relationship was found, while only one country in this group had a positive relationship.

Another element assessed individually was the ratio of expenditure on education to the total expenditure (CF09) (Table 8). A positive relationship with the tax revenue-to-GDP ratio was observed in the case of Croatia (the strongest) and Slovenia (the weakest). In the analysed period, both countries belonged to the third quartile of countries classified according to the criterion of the average tax revenue-to-GDP ratio. The changes in the ratio of CF09 expenditure to the total expenditure in Croatia were explained by the tax revenue ratio in GDP at 53.45% (Figure 5).

Figure 5. *Countries with the strongest positive and negative correlation between the tax revenue-to-GDP ratio and the ratio of CF09 expenditure to the total expenditure*



Source: *Own study as in Figure 1.*

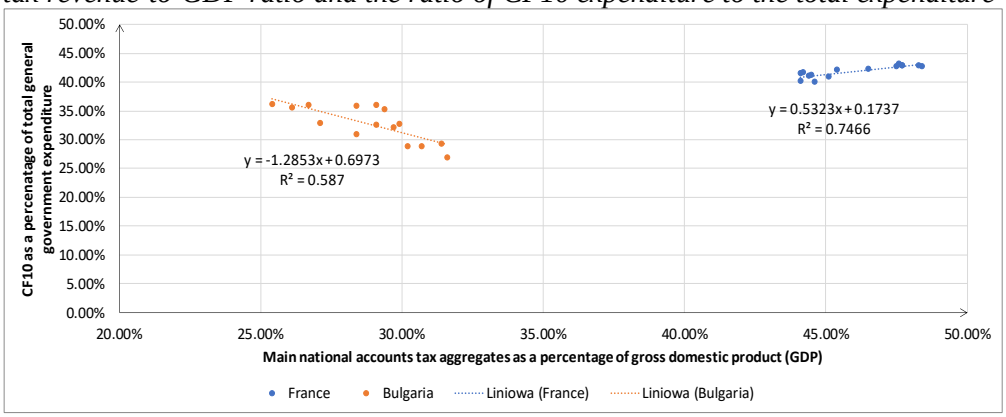
In the analysed period, Croatia increased the ratio of CF09 expenditure to the total expenditure from 7.36% to 11.53% by increasing the fiscal burden on the economy. In Slovenia, however, the regression did not explain the changes in the ratio of this expenditure to a large extent. The negative correlation was confirmed for France (the strongest), Italy, Portugal, Slovakia, Estonia, Finland, and Hungary (the weakest). In the case of France, the tax revenue-to-GDP ratio explained the changes in the ratio of

CF09 expenditure to the total expenditure in the period under consideration at 70.98% (Figure 5). The increase in the fiscal burden in France was accompanied by a decrease in the ratio of CF09 expenditure to the total expenditure from 10.47% to 9.14%. In Finland and Hungary, the regression explained the changes in the ratio of the expenditure under consideration at less than 50%.

More generally, the results obtained do not provide grounds for formulating clear conclusions regarding the relationship between the level of fiscalism and the ratio of CF09 expenditure to the total public expenditure. These relations vary across the EU Member States. Considering the countries included in the 3rd or 4th quartile broken down by the level of fiscalism, there was a positive relationship in two countries, and a negative one in four.

Finally, the relationship between the level of fiscalism and the ratio of expenditure on social protection (CF10) to the total expenditure was assessed (Table 9). A positive correlation was confirmed in the case of nine countries: France (the strongest), Greece, Portugal, Italy, Estonia, Finland, the Netherlands, Sweden, and Malta (the weakest). In France, changes in the ratio of CF10 expenditure to the total expenditure were explained by the tax revenue-to-GDP ratio at 74.66% (Figure 6).

Figure 6. *Countries with the strongest positive and negative correlation between the tax revenue-to-GDP ratio and the ratio of CF10 expenditure to the total expenditure*



Source: *Own study as in Figure 1.*

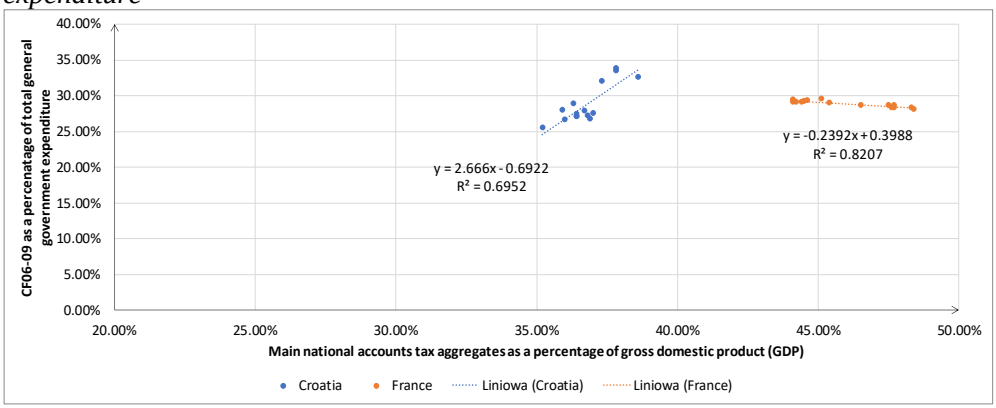
During the period under review, France increased the level of fiscalism, while increasing the ratio of CF10 expenditure to the total expenditure from 40.09% to 42.64%. In the Netherlands, Sweden and Malta, the fiscal burden on the economy did not explain the changes in the ratio of CF10 expenditure to a significant degree. A negative correlation was found for Bulgaria (the strongest), Romania and the United Kingdom (the weakest). In the case of Bulgaria, changes in the tax revenue-to-GDP ratio were explained by the changes in the ratio of CF10 expenditure to the total expenditure at 58.70% (Figure 6). Bulgaria reduced the tax revenue-to-GDP ratio over that reference period from 31.40% to 29.90%, while increasing the ratio of CF10

expenditure to the total expenditure from 29.20% to 32.76%. It should be emphasised that in the case of the UK, the coefficient of determination did not exceed 50%.

More generally, on the basis of the obtained results, in principle, it can be concluded that in countries with a high level of fiscalism, a higher tax revenue-to-GDP ratio corresponded to a greater ratio of CF10 expenditure to the total public expenditure. In the case of six countries out of 14 classified into the 3rd or 4th quartile of countries broken down by the level of fiscalism, a positive relation was identified, while in none of these quartiles there was a negative relation. It should be emphasised that a positive relationship was also characteristic for the EU 28.

Taking into account the result for CF10 and the fact that CF10 expenditure is a dominant item in the structure of CF06-10 expenditure (Table 3), the assessment of public social expenditure excluding CF10 was carried out, i.e. the group of expenditure items CF06-09 (Table 10). In the case of the ratio of CF06-09 expenditure to the total expenditure, a positive correlation with the tax revenue-to-GDP ratio was identified in Croatia (the strongest), Germany, the Netherlands and Lithuania (the weakest) in the analysed period. All the identified countries belonged in the reporting period to the 3rd quartile of countries broken down by the average tax revenue-to-GDP ratio – except for Lithuania, which belonged to the 1st quartile. In the case of Croatia, the tax revenue-to-GDP ratio explained the changes in the ratio of CF06-09 expenditure to the total expenditure at 69.52% (Figure 7).

Figure 7. *Countries with the strongest positive and negative correlation between the tax revenue-to-GDP ratio and the ratio of CF06-09 expenditure to the total expenditure*



Source: *Own study as in Figure 1.*

It should be emphasised that in the reporting period, the fiscal burden in Croatia, measured as the tax revenue-to-GDP ratio, increased from 36.40% to 38.60%. In the remaining countries, the regression relationship did not explain the changes in the ratio of CF06-09 expenditure to a significant degree. The increase in the fiscal burden was accompanied by an increase in the ratio of CF06-09 expenditure from 27.43% to

32.55%. A negative correlation was found in France (the strongest), Estonia, Italy, Portugal, Finland, Greece, Slovakia, and Malta (the weakest). In France, the tax revenue-to-GDP ratio explained the changes in the ratio of CF06-09 expenditure to the total expenditure in the analysed period at 82.07% (Figure 7). It should be noted that in the case of France, a strong negative linear relationship was observed. Furthermore, it should be emphasised that in the reporting period, France significantly increased the tax revenue-to-GDP ratio from 44.10% to 48.40%, which was accompanied by a decrease in the ratio of CF06-09 expenditure to the total expenditure from 29.42% to 28.14%. In Greece, Slovakia and Malta, the coefficient of determination did not exceed 50%. It is worth noting that excluding from the group of analysed expenditure items the expenditure on social protection (CF10) reclassified France, Finland and Italy from the group of countries with a positive relationship – due to the ratio of total social expenditure to the total public expenditure in relation to the tax revenue-to-GDP ratio – to the group of countries with negative dependence.

6. Conclusions

The results of the research carried out with the use of statistical methods and tools allow the following conclusion: in principle, the higher the tax revenue-to-GDP ratio was, the higher the ratio of expenditure on social purposes to the total public expenditure was in the EU Member States with a high level of fiscalism in the years 2004-2018. This relationship has been identified for the total social expenditure. After decomposing these expenditure items into COFOG categories and conducting an appropriate research procedure, it was found that, as a rule, in countries with a high level of fiscalism, the higher the social protection expenditure (CF10) ratio to public expenditure is, the higher the tax revenue-to-GDP ratio is. No correspondent dependence was found for the remaining categories of expenditure. In the case of housing and community amenities (CF06) and recreation, culture, and religion (CF08), higher tax revenue-to-GDP ratio did not correspond to the higher ratio of these expenditure items to the total expenditure.

On the other hand, in the case of expenditure on health (CF07) and education (CF09), different dependencies were found between the ratio of these expenditure items to the total expenditure and the level of fiscalism. The results of the research show that in the EU Member States in the analysed period, the high level of fiscalism was significantly related to the tasks performed by the state in the field of social protection (CF10). As a consequence, a conclusion arises that it is necessary to verify the scope of these tasks in the EU Member States with a high level of fiscalism. Increasing these tasks, or even keeping them at the current level, may mean a further increase in the tax burden on the economy. Not only is this undesirable from an economic point of view, but it may also prove to be impossible to be implemented in the wake of the COVID-19 crisis.

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