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Correlations of Taxation and Macroeconomic Indicators in the OECD Member Countries from 2014 to the First Year of the Crisis Caused by COVID-19

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Abstract: This paper explores the characteristics and inter-relationships of tax systems in the OECD countries over the period 2014–2020, i.e., from a relatively consolidated economic period until the end of the first year of the COVID-19 pandemic. A predictable tax system is essential for the proper functioning of the economy. One of our two main research objectives was to develop a composite indicator for taxation, consisting of tax rates and tax administration time. This composite indicator was then tested using multivariate statistical methods. Our second research objective was to explore the correlation between tax rates, tax burden indicators and macroeconomic indicators over the period 2014–2020, focusing on three years, 2014, 2019 and 2020. An important criterion for the choice of the study years was that 2014 was considered the first overall year of recovery from the crisis, 2019 the last year before the COVID-19 pandemic, and 2020 the first year affected by the pandemic. We investigated the significant differences between the composite indicator categories and the tax burden macroeconomic indicators, and examined and tested correlations between the variables under study (tax rates, tax burden and macroeconomic variables). We found that the amount of working time spent on tax administration is decreasing, presumably due to the increasingly digitalised environment, but this trend has been slightly interrupted by the pandemic. Furthermore, we found that countries with more complex tax systems with a high tax burden perform worse on certain macroeconomic indicators, mainly in southern Europe from a geographical perspective; however, these potentially more burdensome, higher-rate tax systems of more developed countries do not put these countries at a competitive disadvantage. This reflects on the fact that these countries rely on the monetarist school rather than the Keynesian school, a fact which was also compared and considered in our paper.

Keywords: taxation; tax rates; tax burden; macroeconomic variables

1. Introduction

The development of economic thinking has also shaped the economic aspects of taxation. A common feature of the views of economists is that they focus on the description of the tax structure and the choice between tax types, and hence the comparison of the views of the schools of economics is important for our topic.

In our introduction, we review the role of taxation in economic thinking, the role of tax regulation and the OECD, and the links between taxation and competitiveness.

According to Adam Smith's ([1776] 2007) original theoretical framework related to the modern tax system, a good tax system is fair, considers the taxpayer's ability to pay, is clear, predictable, and transparent. It requires the tax to be paid in a timely and appropriate manner, i.e., in a way that is appropriate for the taxpayer. In addition, it is economical to collect, that is the cost of taxation is minimal (Fellegi 2022). Moreover, it provides the state budget with timely and appropriate resources from which a secure state operation can be achieved.

Musgrave and Musgrave (1989) argue that a tax system is just if it can be operated with minimal deadweight loss and cost, facilitating stabilisation policy and efficient administration. Stiglitz (2000) argues that a tax system is economically efficient, simple to administer, flexible, fair, and politically and socially accountable. Classical economists (most notably Ricardo (2001) and Mill (2015) have argued that taxes can keep the economy normal under optimal conditions. In contrast, Keynes (1936) did not believe in the self-regulating capacity of the market and the hegemonic role of taxes, and argued in favour of an interventionist tax system, especially in years of crisis. The Keynesian school advocates progressive income taxation on the grounds of fairness to lower earners, as it does not believe in the full self-regulating capacity of the market. It envisages the proper functioning and regulation of the economy through the application of several tax concessions. In addition, for reasons of fairness, it advocates taxing wages on the same terms as capital income. According to Friedman (1980), the market is capable of self-regulation, even without strong central regulation. Accordingly, he recommends reducing the progressivity of income taxes to avoid holding back performance. That is why he recommends reducing taxes on capital, so as not to prevent capital formation. According to his point of view, a normative, simple tax system can be created by cutting discounts. Friedman also suggests focusing on consumption taxes, which are paid by all economic stakeholders, and also help to relieve progressivity. Table 1 highlights the key differences between the Keynesian and monetarist schools of economists' views on taxation.

Table 1. The Keynesian and monetarist schools of economists' views on taxation.

	Keynesian School	Monetarist School
Income taxes	Progression	Reduction of progressivity
Tax benefits	Many tax benefits, in favour of state interventions	Reduction of benefits
Capital gains	Tax under the same conditions as wages	Reduction, elimination of taxes
Sales taxes	They are low, due to the regressive effect	Preferred, consumption taxed at higher rates

Source: own editing, based on Zaynalov and Ahronov (2019).

The focus of research on taxation includes, among other things, tax regulation and optimal taxation. In the context of optimal taxation, the study by Mirrlees (1986), who examined the problem of redistribution of labour income among individuals with different labour incomes, is noteworthy. Gerritsen et al. (2020) found that a tax on capital income promoted income redistribution. Tuomala and Weinzierl (2020) evaluated tax policies and tax preferences. They found that if taxation were to move from utilitarianism to priority prioritisation, several circularities needed to be modelled. Kanbur et al. (2018) evaluated the possibility of designing an optimal tax system in a country where only a linear tax rate could be applied to reduce poverty. As can be seen, optimal taxation mainly provides support for income taxation, but also helps to design a favourable tax mix.

The OECD plays an important role in the harmonisation of tax systems. Rasmus and Hearson (2019) reviewed the OECD's main measures for the appropriate regulation of taxation. In the early 2000s, tax avoidance was the focus, so after the 2008 crisis, tax base sharing was the focus. From 2013 onwards, tax avoidance was again dominant (Hearson and Prichard 2018; Lips 2018; Lesage et al. 2019), with the global minimum tax coming to the forefront of regulatory issues from the late 2010s.

The tax system must respond to crisis situations, as it did in the context of the 2007 global economic crisis (Rasmus and Hearson 2019). Four key changes have been identified: state intervention, a shift towards emerging markets, austerity, and issues of populism and digitalisation.

Collier et al. (2020) examined the impact of the COVID-19 pandemic on taxation, with their main finding being that states should actively intervene in the crisis that emerged in the wake of the pandemic, in process.

An exhaustive study on the bibliographic analysis of taxation and competitiveness has been carried out by Mazurenko and Tiutiunyk (2021). The theoretical background of the tax-competitiveness nexus was presented by Boiko and Samusevych (2017), as presented in Table 2.

Table 2. The development of research on tax competitiveness.

Authors	Statements
Tiebout (1956)	Demonstrating the phenomenon of voting with your feet in the context of a regional tax system.
Richman (1963) and Kemp (1961)	Examining the effects of non-resident capital on location choice.
Zodrow and Mieszkowski (1986)	Examining the effects of capital mobility and the level of tax rates.
Delgado (2013)	The EU is characterised by convergence in terms of tax structure and tax rates.
Gordon and Wilson (2002)	In addition to capital mobility, it examined the impact of taxation on labour mobility.

Source: own editing based on Boiko and Samusevych (2017).

Another relevant source for our research is the study by Slemrod (2004), whose main finding was that the level of corporate tax revenue in each country is influenced by the tax rates applied in other countries. This thesis was confirmed by the studies of Podviezko et al. (2019a, 2019b), who found that tax competition in the EU started to emerge after the accession of new members, a process that was accompanied by a significant reduction in corporate tax rates in developed old EU member states. It was also pointed out that the reduction in tax rates has been accompanied by a reduction in tax revenues.

One of the effects of tax competition is that countries with lower tax rates are preferred in terms of investments. Barrios et al. (2009), Hines (2003) and Brys et al. (2016) found that the tax rate significantly influences the location of the investment and thus the inflow of working capital, since the burden present in countries with high tax rates increases the return on investment if there are no other discounts. According to Clausing (2007), the increase in unemployment reduces company incomes, thereby reducing corporate tax revenues, due to the lack of demand. Based on Gravelle's (1994) opinion, if consumption taxes are increased, it puts the economy under inflationary pressure (Helcmanovská and Andrejovská 2021; Andrejovska and Pulikova 2018; Banociova and Slavomira 2019).

Helcmanovská and Andrejovská (2021) examined the evolution of corporate tax revenues in EU member states between 2004 and 2019. The EU member states were evaluated by newly acceded countries and by old member states (those that joined before 2004), and they concluded that the average effective tax rate had no effect on corporate tax revenues. At the same time, they found a relationship between unemployment and labour productivity and corporate tax revenues for countries that joined after 2004. Bénassy-Quéré et al. (2014) found that the relationship between tax rates and tax revenues was not clear-cut, with higher tax rates not necessarily associated with higher tax revenues. (Berens and Margarita 2019) found that tax increases and progressivity in income taxation were unpopular measures, yet welfare countries with higher redistributive capacity tended to finance their operations through less progressive tax systems.

The special literature findings presented above were used to formulate the hypotheses of the study presented in this paper. From the literature review, the main economic views on taxation were identified. In our empirical investigation, we have formulated two research objectives with two corresponding hypotheses:

(1)   We create a composite indicator of the sophistication and obscurity of the tax system in relation to the tax rates and the working time for preparing tax returns (by which we mean the over-regulation, complexity of the tax system and the variability of tax rates), which we name the "simple taxation composite indicator" (STCI for short: composite indicator. Three categories (AgC_t) of the points of the composite indicator are formed, which we further investigate.

H1. *The categories created by the composite indicator show a significant difference in relation to macroeconomic variables.*

(2)   Based on the special literature experience, we explore the relationship system regarding the tax rate, tax burden, and macroeconomic variables, using multivariate statistical methodology.

H2. *There is a correlation between tax rates, tax burden indicators and macroeconomic indicators.*

The first hypothesis is tested using variance analysis, while the second hypothesis is tested by correlation analysis.

2. Materials and Methods

The source of the data used was the OECD database, the "t" in the variable names referring to the year under study. The time intervals used are 2014, 2019 and 2020. This is because 2014 was the first (generally consolidated) year of recovery from the subprime crisis in most of the OECD countries, 2019 is the last year before the COVID-19 pandemic, while 2020 is the first pandemic year. The choice of 2020 as the last year was also justified by the fact that it was currently the last year in which all audited data related to the variable under study were available. Based on the time interval considered, we have described the changes in taxes, indirectly inferring the chances of a stable fiscal operation.

Indicators for tax rate and number of taxes:

–   The maximum ceiling of the corporate tax rate (CTR)
–   Value added tax rate (VR)
–   Top personal income tax rate (TIR)
–   Corporate tax time expenditure (CorpTi)
–   Time expenditure on consumption taxes (ConTi)
–   Time expenditure on employment taxes (LabTi)
–   Number of taxes on businesses (PP)
–   Number of taxes on labour (LP)

Tax burden indicators:

–   Tax revenue as % of GDP (TTR)
–   Income and profit taxes as % of GDP (IPtaxes)
–   Social security contributions as % of GDP (SSC)
–   Employee taxes as % of GDP (Payroll)
–   Current taxes as % of GDP (TGS)-

Macroeconomic indicators:

–   Budget deficit of the central budget in % of GDP (GGdef)
–   Change in GDP per capita compared with the previous year (dGDPPpC)
–   Central budget debt in % of GDP (GGdebt)
–   Unemployment rate (HUR)
–   Consumer Price Index (CPI)
–   Change in labour productivity (GDPHRWKD)
–   Foreign direct investment (FDI)
–   Current balance of payments in % of GDP (BOP)
–   Central budget revenues in % of GDP (GGREV)

By using tax rates and time expenditure for tax administration, we aimed to measure the complexity of the tax system, and created our composite indicator (AgCt) using these variables.

With the tax burden variables, we aimed to show the fiscal impact of a given tax revenue. In addition, we show the relationship between tax burden variables and tax rates and macroeconomic variables. These variables were chosen based on our own ideas. Among the macroeconomic indicators, budget deficit on the central budget, the central government debt and central government revenue and balanced of payments were examined by Vörös (2011) in the context of the EU member states and tax rates. Reasons for the choice of the FDI variable are based on Barrios et al. (2009), Hines (2003) and Brys et al. (2016), the unemployment rate variable is based on Clausing's (2007) study and the Consumer Price Index is based on Gravelle (1994) study.

During the development of the composite indicator, we considered the following indicators:

- The maximum ceiling of the corporate tax rate (CTR)
- Value Added Tax rate (VR_t),
- Maximum income tax rate (TIR_t)
- Corporate tax liability time expenditure ($CorpTi_t$)
- Sales tax time expenditure ($ConTi_t$)
- Time expenditure on taxes on labour ($LabTi_t$)

During the calculation of the composite indicator, we formed three categories from the above six variables. The basic principle of this was by comparison with the OECD average value. In the logic of the indicator, international tax follows the foundation index; however, this indicator does not standardize based on the standard deviation but considers the average as the starting point (Bunn and Asen 2021). During the development of the indicator, we strove for an approach based on relatively simple statistical foundations, and therefore, for the three created categories, we created a category above the OECD average, below the OECD average, and below 50% of the OECD average. The established categories follow the logic and delimitation of Vörös (2011). A value above the average received 3 points. If the value of the given indicator did not reach 50% of the OECD average, it received 1 point, and the intermediate value received 2 points. Accordingly, 1 point is low, 2 points medium, and 3 points high. The STCI indicator results from the sum of the values of the six indicators. When categorizing the countries based on STCI scores, countries were rated low between 6–10 points, medium between 11–14 and high between 15–18 points. In this regard, the categories were proportionally divided into thirds.

In connection with our first hypothesis, the obtained composite indicator (AgC_t) was tested using the variance analysis method for the tax burden and macroeconomic variables in the three years examined (2014, 2019, 2020). Our aim was to reveal significant differences (Table 3).

Table 3. Presentation of the research hypotheses.

Serial Number	Hypothesis	Variables	Methodology
H1	The categories created by the composite indicator show a significant difference in relation to macroeconomic variables.	dependent variables: macro-financial and tax burden indicators independent variable: AgC $_t$	analysis of variance
H2	There is a correlation between tax rates, tax burden indicators and macroeconomic indicators.	see below	correlation analysis
(2a)	There is a relationship between the rate of taxes on income and the rate of VAT.	CTR, TIR and VR	
(2b)	A correlation can be shown between the top corporate tax rate and the flow of working capital, based on Barrios et al. (2009), Hines (2003) and Brys et al. (2016).	CTR vs. FDI	
(2c)	A correlation can be shown between labour productivity, taxes on profit and income, based on Helcmanovská and Andrejovská (2021).	TIR and CTR vs. GDPHRWKD	
(2d)	A relationship can be shown between the value added tax rate and the consumer price index, based on (Gravelle 1994; Helcmanovská and Andrejovská 2021; Andrejovska and Pulikova 2018; Banociova and Slavomira 2019).	VR vs. CPI	

Source: own research (2022).

3. Results

The empirical research presented in this study is divided into three subchapters: the descriptive statistical analysis of the composite indicator, the variance analysis related to the first hypothesis, and the correlation analysis related to the second hypothesis.

3.1. Descriptive Statistical Analysis of the Composite Indicator Variables

Table 4 presents the descriptive statistical analysis of the tax rates used for the composite indicator.

The evolution of the top corporate tax rate (CTR) shows that the average tax rate in the OECD countries was 25% in 2014. However, trends show a decrease in average tax rates in 2019 and 2020 compared with the base year 2014. The standard deviation rate has decreased from 7% in 2014 to 6% in 2019, which is below 30% compared with the average. This implies that there is no significant dispersion in the corporate tax rate of the OECD countries under study. In 2020, the median value is equal to the average, so the average is a good description of the characteristics of the countries under study. The minimum value has decreased compared to 2014, due to the introduction of the single rate of 9% in Hungary. The bottom quartile is 20% in all years under review, so a quarter of countries apply a lower rate. However, the upper quartile has been gradually decreasing. A striking trend is that by 2019, compared to 2014, 16 countries have opted for a tax cut, while five countries have increased their tax rate. The trend across the three years assessed is that corporate tax rates are being cut by policy makers, especially in countries where the top tax rate was exceptionally high.

The average value-added tax rate in the OECD countries was 19% in all years under review, while the standard deviation fell from 6% to 5% over the same period. The relative dispersion was 32% in 2014, shrinking to 26% in 2019, indicating a low degree of dispersion. The minimum, i.e., the lowest value added tax rate applied, increased over the period analysed. The highest value added tax rate was observed in Hungary, with a value of 27%,

which remained unchanged over the period analysed. The lower quartile, as well as the minimum tax rates, showed an increase, while the upper quartile remained significantly unchanged. Looking at the trends further, we find that six countries have seen tax changes from 2014 to 2019. Without exception, the changes have been accompanied by an increase in tax rates. The typical tax increase was three percentage points. However, for 2020, two countries decided to change tax rates, with one reducing and one increasing the tax rate.

Table 4. Descriptive statistical analysis of the variables used for the composite indicator I.

Variables	CTR14	CTR19	CTR20	VR14	VR19	VR20	TIR14	TIR19	TIR20
N	36	36	36	36	36	36	36	36	36
Mean	25%	24%	23%	19%	19%	19%	42%	42%	43%
Std. Deviation	7%	6%	6%	6%	5%	5%	12%	12%	12%
Variance	0%	0%	0%	0%	0%	0%	2%	2%	1%
Range	26%	25%	23%	22%	20%	20%	42%	42%	42%
Minimum	13%	9%	9%	5%	7%	7%	15%	15%	15%
Maximum	39%	34%	32%	27%	27%	27%	57%	57%	57%
Deciles									
10	16%	18%	14%	9%	10%	10%	20%	19%	24%
20	19%	19%	19%	13%	15%	15%	31%	32%	32%
25	20%	20%	20%	15%	17%	17%	33%	34%	**34%**
30	21%	20%	20%	16%	19%	19%	36%	35%	36%
40	22%	22%	21%	20%	20%	20%	42%	44%	44%
Median	25%	25%	23%	20%	21%	21%	46%	46%	**46%**
60	26%	25%	25%	21%	21%	21%	47%	47%	47%
70	30%	28%	26%	22%	22%	22%	50%	51%	51%
75	30%	28%	28%	23%	23%	23%	51%	53%	**53%**
80	31%	30%	29%	23%	24%	24%	52%	54%	54%
90	35%	31%	31%	25%	25%	25%	55%	55%	55%

Source: own research based on OECD data (2022).

The average top personal income tax rate has followed a slight upward trend over the period under review, with the standard deviation remaining unchanged at 12%. The relative standard deviation, also for this indicator, is below the threshold of 30%. This means that there is no significant dispersion in the indicator under examination. The median value is higher than the average, with a typical deviation of 10%, which is not significant. The minimum value in 2014 was in Lithuania, while in 2019 and 2020 it was in Hungary, which had a single PIT rate of 15%. In eight cases, the parliaments of these countries decided to reduce the tax rate, while in the same number of cases they decided to increase it, with the overall result of the changes being positive. Then, in 2020, ten countries increased their tax rates, while eight decreased it; however, the result was also positive.

Another important element of tax liability is the amount of time spent, which measures the working time for the preparation of the given tax return expressed in hours per taxpayer. When analysing these data, the different deciles are more prominent.

As Table 5 shows, the average time spent on corporate tax returns is decreasing in the OECD countries. The relative standard deviation exceeds 30% in each year, resulting in a significant dispersion of values. There is also a strong dispersion of the data based on the value of the coverage, which measures the difference between the minimum and maximum. The largest decrease in the volume of time spent is observed between 2014 and 2019, and one obvious reason for this could be the longer comparison period. In 2020, some

deciles, especially those above the median, show an increase of a few working hours, due to possible IT or regulatory difficulties in the wake of the pandemic. In several countries, it was necessary to postpone the filing deadlines, for example for Hungary the deadline for corporate tax returns was extended by five months.

Table 5. Descriptive statistical analysis of the variables used for the composite indicator II.

		CopTi14	CorpTi19	CorpTi20	LabTi14	LabTI19	LabTi20	ConTi14	ConTi19	ConTi20
N	**Valid**	36	36	36	36	36	36	36	36	36
Mean		46	43	43	70	67	66	58	54	55
Std. Deviation		29	25	26	39	36	36	32	29	34
Variance		856	622	663	1 522	1298	1287	994	862	1190
Range		145	105	105	184	155	155	117	117	164
Minimum		10	5	5	14	14	14	8	8	8
Maximum		155	110	110	198	169	169	125	125	172
Deciles	**10**	20	17	17	29	27	27	24	21	21
	20	23	21	21	40	38	37	28	27	27
	25	**25**	**25**	**24**	**41**	**40**	**40**	**32**	**30**	**30**
	30	30	28	27	45	43	41	36	34	33
	40	34	34	34	55	50	50	40	39	39
	Median	**38**	**38**	**38**	**63**	**61**	**61**	**49**	**46**	**45**
	60	43	41	42	75	67	66	60	59	53
	70	50	46	48	85	80	80	71	69	69
	75	**52**	**52**	**52**	**89**	**86**	**83**	**90**	**74**	**74**
	80	67	61	61	95	90	89	96	82	80
	90	89	84	87	127	128	127	106	97	101

Source: own research based on the OECD data (2022).

Over the period under review, the corporate tax filing period has been on a downward trend or stagnant, except for the year 2020. This is not covered by our analysis, but it can be assumed that the decline in tax filing time may be due to the increasing role of digitalisation, both from the taxpayer's and the tax administration perspectives. It can also be concluded that the reduction in the number of working hours spent on tax returns is mainly due to countries where the time needed to prepare tax returns was already lower.

The average time taken to prepare a tax return for labour taxes also shows a downward trend over the period, but the number of tax items leads to higher what-ifs and maximums. The relative standard deviation is also over 30%, while the median is within 10% of the average. From the analysis of the data, it can be deduced that the time needed to file returns is decreasing in all deciles, with a rare case of stagnation. The largest decrease in time is between 2014 and 2019, with a significant decrease in the time taken to complete a tax return, except for the top decile. Further decrease or stagnation is observed in the deciles after the corporate tax return, with a particularly significant decrease in the countries with higher time requirements by 2020.

The trend for sales taxes is that the average time taken to prepare a return has decreased for 2019, as has the standard deviation. The relative standard deviation value exceeds the 30% threshold for this indicator in all the years under review, with the median being more than 10% below the average. The trend for sales taxes is a decrease of four hours on average in 2019, but a slight increase in 2020. This is due to a four-hour increase in time taxes in the top decile category, which is considered the most complex, but a decrease in the top

decile. The main reason is the increase in man-hours for the country with the highest time expenditure.

3.2. Examination of the Distribution of Categories Formed from Composite Indicators

In the following, we present the score obtained by the composite indicator for each country, based on the three categories described in the material and methodology chapter. The purpose of this is to present the classification of each country's categories and its changes.

In the period under review, the composite indicator shows that the obscurantism of the tax system was low in two countries in 2014 and in 3–3 countries in 2019 and 2020, which is considered a positive result based on mainstream economic theories. The largest share of the tax system is of medium complexity, while it is typically considered complex at levels above 20% across the OECD countries. Our analysis concludes that Estonia and Switzerland had the most complex tax systems in 2014. Estonia retained this status in all three years, while Switzerland was considered to have the simplest tax system until 2019. Our analysis shows that in 2020 the US caught up with Switzerland.

Based on the analysis of the data, the countries with high obscurity tax systems showed a relative constancy; from 2019, Chile was included among the countries with such characteristics, but by 2020 it was already out of this circle. In the last examined year, Slovakia was included in the group of countries with highly obscure judicial tax systems, while Portugal was excluded from it. The indicator therefore showed a relatively significant stability, as the number of groups formed in each reviewed year was similar. In all three years, the following countries belonged to the group of high obscurity tax systems: Austria, Colombia, Germany, Greece, Italy, Slovenia, and Spain (Table 6).

The 36 countries surveyed were grouped into seven regions in our analysis to determine whether there are geographical characteristics of tax system sophistication. The analysis was performed using a cross-tabulation analysis, which found a significant correlation between the composite indicator category and geographic location for 2014 and 2019, as the Chi^2 test value was below the 5% significance level, although it was only slightly below this threshold in 2014. The Chi^2 test statistics conditions were met prior to the study (we highlighted only those variables where the Chi-square test was significant).

The strength of the relationship was stronger than medium for both years, based on Cramer's V Indicator. Cramer's coefficient V is an effect size measure for the chi-square test of independence. It measures how two categorical fields are associated. If the Cramer V indicator is above 0.5, a strong effect can be established. (Table 7).

Figure 1 shows the most common composite indicator category for a given region. The complexity of the tax system is medium in northern and western Europe, as well as in North America and the EU Member States in eastern Europe, Asia, and Oceania. A tax system with low obscurity does not have a typical geographical characteristic, while a tax system with a high degree of sophistication was a feature mainly of southern Europe and, in 2019, South America.

Table 6. Distribution of the categories of the composite indicator in the examined years.

Country	AgC14			AgC19			AgC20		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Australia		X			X			X	
Austria			X			X			X
Belgium		X			X			X	
Canada		X			X			X	
Chile		X				X		X	
Colombia			X			X			X
Czechia		X			X			X	
Denmark		X			X			X	
Estonia	X			X			X		
Finland		X			X			X	
France		X			X			X	
Germany			X			X			X
Greece			X			X			X
Hungary		X			X			X	
Iceland		X			X			X	
Ireland		X			X			X	
Italy			X			X			X
Japan		X			X			X	
Korea		X			X			X	
Latvia		X			X			X	
Lithuania		X			X			X	
Luxembourg		X			X			X	
Mexico		X			X			X	
The Netherlands		X			X			X	
New Zealand		X			X			X	
Norway		X		X			X		
Poland		X			X			X	
Portugal			X			X		X	
Slovakia		X			X				X
Slovenia			X			X			X
Spain			X			X			X
Sweden		X			X			X	
Switzerland	X			X				X	
Turkey		X			X			X	
United Kingdom		X			X			X	
United States		X			X		X		
Total	**2**	**26**	**8**	**3**	**24**	**9**	**3**	**25**	**8**

Source: Own research and construction based on OECD data (2022). "X" shows the classification of the countries.

Table 7. Correlation analysis between territorial location and the categories of the composite indicator.

	AgC14 vs. Region		AgC19 vs. Region	
	Value	Approx. Sig.	Value	Approx. Sig.
Cramer's V	0.574	**0.049**	0.611	**0.02**
Pearson Chi-Square	Value	df	Value	df
	23,735	14	26,886	14

Source: own research and construction based on OECD data (2022).
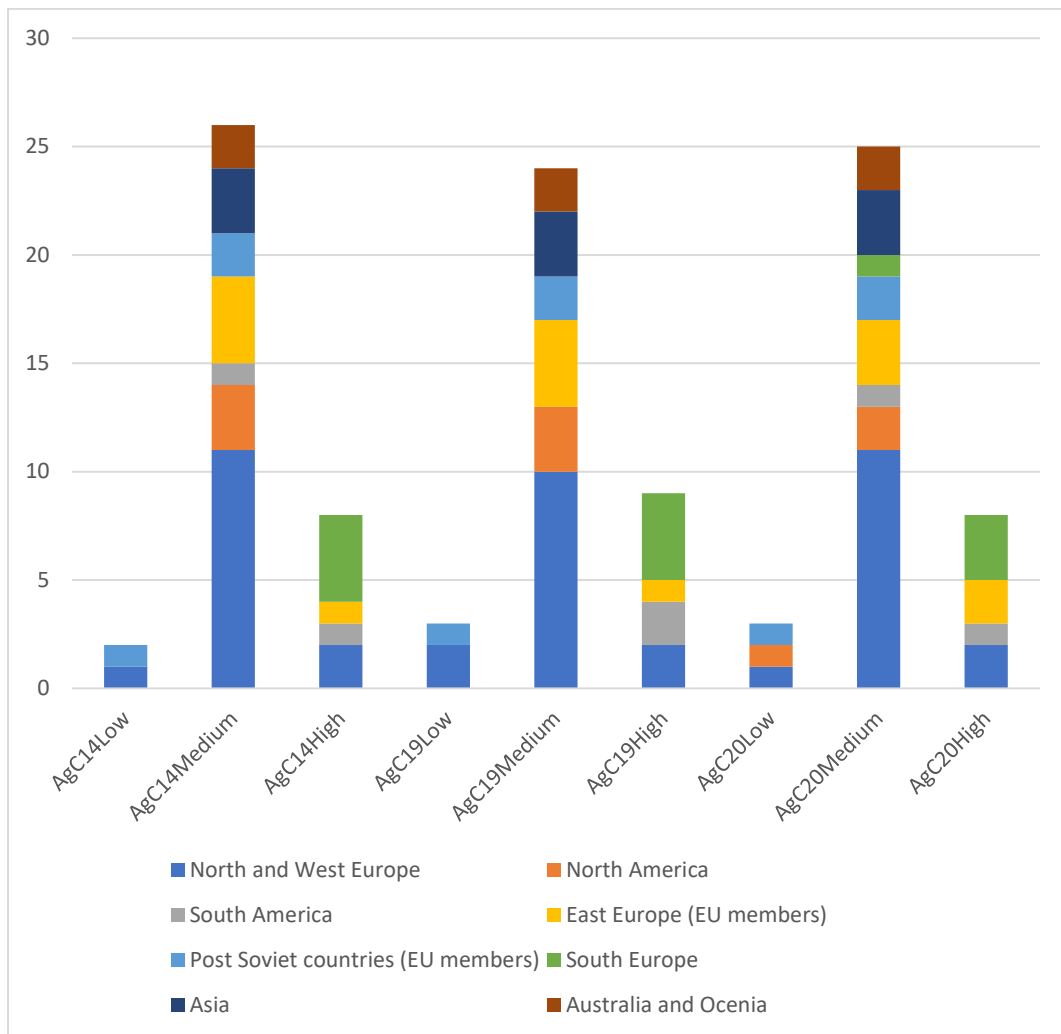
Figure 1. Distribution of the composite indicator by region (Source: own research, 2022).

3.3. Evaluation of Differences between the Composite Indicator and the Investigated Variables

In the following, we project the effects of the composite indicator categories on macroeconomic and tax burden variables in the OECD countries. To do so, an analysis of variance is carried out among the composite indicator categories and between the tax burden and macroeconomic variables, to detect whether there is a significant difference between tax systems. All the variables presented in the chapter on materials and methodology were included in the analysis, but only 2 variables in each year showed significant differences. The source of the macroeconomic data was the OECD database (dependent variable). The independent variable was the composite indicator. For these results the assumptions of the analysis of variance were met.

The analysis shows that there was a difference in the unemployment rate (HUR) in each of the years under review. In 2014, there was a significant difference in the GDP share of taxes on labour (Payroll), in 2019 in the budget deficit to GDP (GGdef), while in 2020 there was a significant difference in the GDP growth rate (GDPgr) (Table 8).

Table 8. Analysis of variance (ANOVA) table result.

Variable	Variance	Sum of Squares	df	Mean Square	F	Sig.
Payroll2014	Between Groups	0.001	2	0	4692	0.016
	Within Groups	0.002	33	0		
	Total	0.003	35	0		
HUR14	Between Groups	0.04	2	0.02	9518	0.001
	Within Groups	0.07	33	0.002		
	Total	0.11	35			
GGdef19	Between Groups	0.004	2	0.002	3308	0.049
	Within Groups	0.021	33	0.001		
	Total	0.025	35	0		
HUR19	Between Groups	0.016	2	0.008	7965	0.002
	Within Groups	0.033	33	0.001		
	Total	0.048	35			
GDPgr20	Between Groups	0.009	2	0.004	4089	0.026
	Within Groups	0.036	33	0.001		
	Total	0.045	35			
HUR20	Between Groups	0.016	2	0.008	6842	0.003
	Within Groups	0.038	33	0.001		
	Total	0.054	35	0		

Source: own research and construction-based OECD data (2022).

We also examined the means plots that showed that countries with a high degree of sophistication in the tax system had a much higher unemployment rate than the other two categories in all years examined. This fact is mainly specific to southern European countries, which may be higher due to the conditions of employment and tax rates. In 2014, countries with less complex tax systems had the highest employee tax revenue as a share of GDP. The same pattern can be observed for the 2019 fiscal deficit, but the graph has a different meaning, as a simpler tax system is associated with a fiscal deficit. In 2020, GDP declined in all but three countries, mainly due to the impact of the pandemic. The rate of decline was significantly higher for countries with a sophisticated tax system.

3.4. Correlation Analysis

A correlation analysis was carried out among the variables examined, based on the average of the three years studied. These are summarised in Table 9. For reasons of visual simplification, we only show those relationships where a relevant correlation can be discovered at an appropriate level of significance.

Table 9. Result of the correlation analysis.

Variables	CTR	VR	TIR	LP	IPTAXES	TTR	SSC	Ggdef	GDPgr	Ggdebt	CPI	GDPHRWKD	FDIFLOW
CTR		−0.468 **	0.469 **						−0.515 **			−0.557 **	
PP				0.448 **									
VR	−0.468 **							0.416 *	0.394 *				
TIR	0.469 **								−0.416 *	0.446 **	−0.330 *	−0.453 **	
LP													−0.399 *
ConTi													
IPTAXES						0.532 **							
TTR					0.532 **		0.757 **						
SSC						0.757 **							
TGS						0.594 **	0.480 **				−0.392 *		

** Correlation is significant at level 0.01. * Correlation is significant at level 0.05.

The analysis shows that the relationship between the top corporate tax rate (CTR) and the value added tax rate (VR) is negative, i.e., inversely related, with a strength of less than medium. A striking example of this is Hungary, which has the highest value added tax rate among the OECD countries and one of the lowest corporate tax rates. The economic views discussed in the tax theory section illustrate this fact, as the Keynesian view in this respect favours taxes on income, while the monetarist view favours sales taxes. The logic of the monetarist view is confirmed in the OECD countries by the fact that there is a weaker than medium positive relationship between the top personal income tax rate (TIR) and the top corporate tax rate. The results show a stronger-than-medium negative relationship between the GDP growth rates and labour productivity and also between GDP growth rates and the corporate tax rate. It suggests that in countries with a high tax rate, GDP growth (GDPgr) and labour productivity (GDPHRWKD) are restrained, as a significant part of the profits is diverted, and firms are unable to invest significantly in efficiency gains.

The study revealed a weaker-than-average positive relationship between the general rate of value added tax (VR) and the GDP growth (GDPgr) and also between the general rate of value added tax (VR) and the budget deficit (GGdef). From this, we conclude that the choice of the tax rate has strong indirect economic and budgetary effects, since we examined no correlation between sales taxes and the GDP ratio (TGS).

The upper band of personal income tax also has a significant budgetary impact, which shows a stronger-than-average negative relationship with GDP growth (GDPgr), as well as with the consumer price index (CPI) and labour productivity (GDPHRWK), and at the same time a positive relationship with the level of public debt (GGdebt). The consequence that can be deduced from this is that if the top rate of personal income tax is high, it provides considerable budgetary room for manoeuvre and does not increase the consumer price index directly, but restrains work performance and thus presumably has an effect of inhibiting GDP growth.

There is a positive relationship between the number of taxes on labour (LP) and the number of taxes on profit (PP), suggesting that where there is a significant burden on business management, labour is taxed to a similar extent. The analysis also reveals a negative relationship between FDI (FDIFLOW) and the number of taxes on labour (LP), where the relationship is weaker than medium, suggesting that the number of taxes on labour negatively influences capital inflows into the country.

Based on the data, it can be concluded that there is a stronger-than-average positive relationship between total tax revenue (TTR) and taxes on income and profits (IPTAXES) and sales taxes (TGS), while there is a strong positive relationship between social security contributions (SSC) and total tax revenue relationship, as shown. The budgetary role of sales taxes, on the other hand, already shows a negative relationship with the consumer price index, but its level is weaker than average.

4. Discussion

We were able to partially support both of our hypotheses with the conducted empirical investigation. Regarding our first hypothesis, data from Table 8 on the analysis of variance illustrates how the categories formed from the composite index showed a significant difference in unemployment every year, but in 2019 the central budget balance and GDP growth revealed the tax systems with different obscurity factors (i.e., the complexity of the tax system, the level of tax rates) to have significant difference between countries, and thus we consider H1 to be partially accepted. Regarding these indicators, it can be stated that the macroeconomic indicators of countries with highly sophisticated tax systems are worse than those of the countries with less sophisticated tax systems, in both medium and low categories.

Our second hypothesis consisted of four sub-hypotheses, of which two have been accepted, and two have been rejected. The sub-hypothesis marked "a" of the second hypothesis was proven, by revealing a negative relationship between the upper rate of corporate tax and the rate of value added tax, as indicated by the data presented in Table 9.

From this, we draw the conclusion that there is a choice between the theoretical tax views of the economic schools, and this consequence can be deduced from the negative relationship. This fact therefore leads to the conclusion that in the preferences of the examined countries, either turnover/consumption taxes or income taxes, i.e., taxes on the income of companies, are preferred. We accepted sub-hypothesis "c" of our second hypothesis also indicated in the data presented in Table 9, as the study revealed a negative relationship between labour productivity and tax rates on income and profit, which suggests that high tax rates result in withholding performance, in line with the views of the monetarist school of economics.

The study did not confirm the correlations found in the literature that there is a positive relationship between corporate tax rate and working capital flows, i.e., that working capital inflows are basically preferential to safe public finances rather than the corporate tax rate, nor did our study find a relationship between the value added tax rate and the consumer price index up to 2020. The corresponding data can also be found in Table 9.

The research found that a significant proportion of the countries surveyed cut corporate tax rates from 2014 to 2019, with the presumed aim of encouraging tax hikes and keeping companies in business to ensure prosperity, a trend that continued in 2020, even in the year affected by the pandemic.

In addition, the research shows the following new and novel results:

- Tax administration burdens have decreased in most countries. The trend was slightly interrupted by the impact of the pandemic for VAT and corporate tax.
- In terms of geographic characteristics, southern Europe and South America are considered as the most complex group of countries in terms of tax systems, based on composite indicator categories in our analysis.
- A more complex and burdensome tax system is associated with unfavourable macroeconomic and tax burden indicators in some respects.
- A possible increase in tax rates on income and profits may have a spill-over effect on GDP growth, while an increase in consumption taxes does not have such a spill-over negative effect, confirming the research of Bunn and Asen (2021).

5. Conclusions

As a general trend, taxes on corporate income have decreased, while taxes on consumption have increased in the OECD countries, and there has been a slight increase in personal income tax. At the time of starting our research, the year 2021 was not yet the subject of the study, but it can be concluded that the top rate of corporate tax is unchanged, i.e., countries have not changed their tax rates significantly. However, there have been tax cuts for some countries, such as France and Switzerland, and Greece. In the case of Turkey, an increase has been decided.

The VAT rate did not change in any country in 2021, suggesting that countries did not want to curb consumption. Top personal income tax rates are typically unchanged, but the picture is mixed. Three countries have seen tax cuts: Greece, Sweden and the The Netherlands. Turkey and Lithuania increased their top personal tax rates.

These factors suggest that there were no significant changes in the tax systems of OECD countries in 2021, and that where there were changes, they were typically made in order to cushion the effects of the crisis by cutting taxes, or to deal with the effects of rising inflation by raising taxes, in the case of Turkey (https://stats.oecd.org/, accessed on 11 October 2022). As a result of the pandemic, the trends identified have not changed significantly.

In our view, the pandemic and the post-pandemic situation will make it especially important to establish a well-functioning tax system that does not necessarily have a negative impact on the functioning of the economy, which is simple for taxpayers, and has low administrative costs for the tax authorities. On the other hand, the tax system has an important role to play in ensuring fiscal stability, and hence, policy makers need to consider a dual perspective when designing the appropriate tax mix. Based on our research, an

interesting next step could be the development of an econometric model that would focus on assessing the predictability of tax systems.

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