



Assessment of the Redistribution Function of Corporate Income Tax

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ABSTRACT

Purpose: The paper describes the relations between non-uniformity of incomes and possibilities of influencing their diversification through the fulfilment of the redistributive character of taxes. The purpose of this paper is to examine the redistributive function of corporate tax and to assess its progressive character. *Methodology:* The investigated redistribution function of the selected tax is the analysis of calculations of tax progressivity rate (according to the methodology of M. Kakinaka and R. Pereira, 2007) and Gini coefficients. A cluster analysis evaluates the relation between the progressivity level of the selected tax, the Gini coefficients and selected macroeconomic variables. *Approach:* The rate of tax progressivity is determined by the tax progressivity index, which is reflected in the level of tax incomes in the period of 2007–2018. The object of interest (corporate income tax) is examined in the EU-28 Member States. We applied the mathematical methods in Excel and R environment by using cluster, NbClust, nFactors, gg dendro and rgdal packages. *Findings:* The tax progressivity of the corporate income tax can be considered to be progressive in the EU-28 during the reported period. The examined tax has the potential to affect the level of income inequality and thus, by its nature, impact the income diversification. The absolute values of corporate tax incomes in the EU-28 are among the lower, which may, in conjunction with other exogenous variables, partially disrupt the character of this tax. The results of empirical research shows that countries have more often serious income inequalities which are not sufficiently balanced by either a system of benefits and transfers, nor by collection of tax incomes.

INTRODUCTION

The inefficient distribution of income among the economic units is one of the reasons for market mechanism's failure, mainly due to the existence of imperfect competition, the existence of externalities as a side effect of production, the existence of public goods and the asymmetry of

information. Due to the unequal income differentiation, the role of a state, in the context of its political and ideological choices, is to impact and in particular, to reduce the income differences. The tax system is an instrument through which the collective expenditures are paid, e.g. in the form of supporting the low-income groups of the population. The role of taxes expanded in the 1960's. At that time, the public interest in taxation with the aim of achieving the economic growth has shifted to a new aim of efficient and fair distribution of incomes. In the context of redistributive effects of taxes, the public perceives the transparent-and-compare approach, which is the use of tax policy in the context of unequal income differentiation (Lambert et al., 2011).

The critical is what taxes a country uses to achieve the public revenues. In general, it can be agreed that the EU Member States have approximately the same structure of direct taxes. However, the way of income distribution in society points to differences not only between the countries but also between periods and that is due to several reasons. I. Joumard et al. (2012) summarized the specificities of the public revenues' redistribution into three aspects, namely the size of collected taxes and provided transfers, their combination with other factors and the progressiveness of each component separately. The authors stated that some countries with a relatively simple tax and social system (such as Australia) achieve the same redistribution effect as countries characterized by much more complex tax system, with higher collected taxes and provided transfers (such as Germany).

The paper describes the relations between non-uniformity of incomes and possibilities of influencing their diversification through the fulfilment of the redistributive character of taxes. The purpose of this paper is to examine the redistributive function of corporate tax and to assess its progressive character. The analytical part is divided into sections with the main objective to test the hypothesis:

H₁: *The progressive character of corporate tax incomes represents a factor influencing the redistribution of incomes.*

1. LITERATURE REVIEW

The redistributive effects of taxes are determined by individual types of taxes differently, depending on the taxation progressivity (Kubatova, 2010). While the individual income tax (hereinafter referred to as "FO") and property taxes are generally understood to be progressive, in case of the corporate income tax (hereinafter referred to as "PO"), the progressiveness of taxation is U-shaped (the regressive character for small and large PO and progressive character for medium-sized PO) (Prasad, 2008). The more this tax is constructed as progressive, the more it fulfils the redistributive function. Its progressive character is not definitive. It is often influenced by the amount of statutory tax rate, e.g. in Syria, progressive rates are in the range of 10-28 % depending on the specific type of business, in the United Arab Emirates it is in the range of 50-55 % for gas and oil trading companies. (Deloitte, 2018). The taxation progressivity does not need to be only the part of tax rate, but can also function through tax deductions. The corporate income tax also exists in a regressive form, where it is associated with measures that lead to implementation of a regressive tax element, e.g. in the form of determining the social security payment.

W. Li and P. Sarteho (2004) examined the change of taxation progressivity associated with the adoption of The Tax Reform Act of 1986 in the USA. Their research was based on narrative analyses. The change in tax progressivity led to a change in income diversification, when the Gini coefficient dropped by 4 percentage points compared to the previous period. A similar research was carried out by C. Weller (2007). D. Duncan and K. Sabirianova (2008) have shown that a higher tax progressivity can cause, under certain conditions, an increased inequality in income distribution. One way of observing the companies' taxation progressivity is to tax their capital income (Piketty and Saez, 2007; Harberger, 1962). If the tax rate is set at an appropriate level, it encourages the company to take risk and expand the business sector, but at the same time, such tax creates an

ineffective lock-in effect. L. Burman and D. Moynihan (2011) showed that 94 % of the tax relief value provided for capital income in the US benefited the upper quintile of the society. Similar conclusions were shown by P. Diamond and E. Saez (2011). A. Harberger (1998, 2008) conducted microsimulations in an open economy where the capital could freely flow across international borders. The high mobility of capital, supported by an increasing globalization, has influenced the growth of taxable income and tax burden. In the open economies, the growing tax burden has been completely shifted to the labour sector in the form of lower wages. The corporate tax thus lost its progressive character. The redistribution effect of tax is disrupted in today's open and globalized economies. Similar findings have been made by R. Birt and E. Zolt (2006), according to which the redistribution effects of taxes are the most weakened in developing countries.

The rate of income inequality can be determined by several techniques, such as the Lorenz curve, the Gini coefficients, the Robin-Hood index, the Atkinson index, the Kuznets curve, respectively the non-robust indicator of income inequality coefficient $S80/20$ (Labudova, Vojtkova and Linda, 2010). A higher rate of tax progressivity reduces the income inequality observed by the Gini coefficient. The approximated Gini coefficient has a significantly lower impact (Weller, 2007). The impact of the redistribution role of taxes, in the form of observing the tax and public expenditure policies, was analysed by J. Martinez-Vazquez, V. Vulovic and B. Vulovic (2014) in 150 developing and developed countries during 1970-2009. Progressive taxes led to a decrease of income inequality, observed through the Gini coefficient. The countries with higher income inequality relied more on direct tax revenues, while their increase led to a decrease in income redistribution inequality. This effect has diminished in open and globalized economies. An important role in explaining the income inequality is also played by a set of external socio-economic factors, such as population growth, age structure of population, growth of GDP per capita, unemployment rate, extent and rate of corruption, level of education, what was emphasized by e.g. S. Gupta, Davoodi and Alonso-Terme (2002) or B. Milanovic (2006).

2. RESEARCH OBJECTIVE, DATA AND METHODOLOGY

The objective of the analysis is to examine the rate of corporate income tax progressivity by using the tax progressivity index over the period 2007–2018. The analytical part of the paper is divided into three sections that complement each other. The object of interest is examined in the EU-28 Member States in order to test the hypothesis: The progressive character of corporate tax incomes represents a factor influencing the redistribution of incomes. How does the tax system change the final distribution of incomes in society? The observation of income diversification in the form of examining the standard of living is often carried out through the GDP *per capita* indicator (Eurostat, 2020). However, this indicator does not provide sufficient information on income distribution or non-monetary factors. The redistributive role of taxes is therefore examined through a global tax progressivity. The greater the share of this tax to GDP is, the greater is its potential impact on income redistribution. This is monitored by the Gini coefficients before and after the adjustment by the social transfers and benefit system (Weller, 2007; Duncan and Sabirianova, 2008). The first section of the paper's analytical part describes the values of Gini coefficients in the countries under review. The Gini coefficient expresses how much the country's income distribution deviates from a totally perfect and equal distribution. The Gini coefficient is derived from the Lorenz curve. It captures the area between the Lorenz curve and the hypothetical line of absolute equality. The Gini coefficient equal to 0 represents a perfect distribution of income, the Gini coefficient equal to 100 represents a complete inequality of income distribution.

The second part of the paper's analytical part evaluates the tax progressivity index. The rate of tax progressivity is determined based on the Lorenz curve. The higher degree of tax progressivity has always a positive impact on income diversification, which is monitored through the tax progressivity index (Kakinaka and Pereiro, 2006). The impact of tax changes and income distribution is captured in their ratio to GDP. Approaches to determine the global tax progressivity require

knowledge of the income distribution of the tax burden in society. A different approach is proposed by M. Kakinaka and R. Pereira (2006). The authors eliminate the disadvantage of quantifying the global tax progressivity indicator, resulting from an insufficient database and they introduce the tax progressivity index, which is based on the relative volatility of tax revenues. The index of tax progressivity is determined by the following relation:

$$\gamma_t = \frac{\hat{\sigma}_{T,t}}{\hat{\sigma}_{Y,t}} \quad (1)$$

where, $\hat{\sigma}_{T,t}$ represents the variation coefficient of tax revenues in the period t , $\hat{\sigma}_{Y,t}$ is the variation coefficient of GDP in the period t . The tax system is progressive if the value of the variation coefficient of tax revenues is higher than the value of the variation coefficient of GDP in the period t . The tax system is regressive if the value of the variation coefficient of tax revenues is lower than the value of the variation coefficient of GDP in the period t . If the variation coefficients are equal, it is a proportional tax system in the period t .

The third section of the paper's analytical part focuses on the assessment of the progressive character of corporate tax revenues, in combination with other measurable quantitative indicators through the categorization of the EU-28 countries. The selected indicators are:

- the index of tax progressivity of corporate tax revenues determined by the methodology of Kakinaka and Pereira (2006), referred to as *Progressive*,
- the Gini coefficient before adjustment by the system of benefits and transfers, determined in the range <0-100>, referred to as *Gini_Before*,
- the Gini coefficient after adjustment by the system of benefits and transfers, determined in the range <0-100>, referred to as *Gini*,
- GDP growth *per capita* in % of the previous year, referred to as *Growth*,
- GDP *per capita* in EUR, referred to as *GDP*,
- Unemployment rate in %, referred to as *Unempl*.

The resulting cluster analysis includes three selected variables which have been identified as suitable for clustering of countries, based on the KMO criteria. These variables include the progressivity of corporate tax revenues (*Progressive*), the Gini coefficient benefits and transfers (*Gini_Before*) and the resulting Gini coefficient after transfers (*Gini*). Along with these variables, there are also other stated variables and the share of corporate tax revenues on GDP (*CTR*) evaluated in interpreting the results. Data standardization is used with the aim to eliminate possible deflections due to the inconsistency of input variables. The Euclidean distance is used to determine the distance between individual countries. The distance (D_E) is determined by the relationship between the i -th and j -th object \mathbf{X} as follows:

$$D_E(\mathbf{X}_i, \mathbf{X}_j) = \sqrt{\sum_{t=1}^m (x_{it} - x_{jt})^2} \quad (2)$$

G. Milligan and M. Cooper (1985) made a comprehensive comparison of hierarchical agglomerative methods. They consider the Calinski and Harabasz algorithm, the Duda and Hart algorithm and the C-index to be effective clustering methods. The determination of optimal number of clusters is determined through the algorithms TraceW index (in hierarchical procedures), the Rubin index, the Ball index and the Gap index. A dendrogram is a graphical representation of the hierarchical clustering. The k-averages method is used to determine the similarity of objects based on the non-hierarchical clustering because individual objects are characterized exclusively by quantitative variables. The Hartigan and Wong, the McQueen, the Lloyd and the Forgy algorithms are used. The Table 1 provides the information on the algorithm used, the method of determining the optimal number of clusters, the critical value level and the optimal number of clusters.

Table 1. Determination of optimal number of clusters according to selected algorithms

Algorithm	Optimal number of clusters	Value_Index	Number of clusters
TraceW index	The maximum value of absolute second differences between index levels	6.1169	4
Rubin index	The minimum value of second differences between index levels	-0.1884	4
D-index	The minimum value of second differences		4

Source: Authors' own elaboration

The data base of the EU-28 Member States' sample is obtained from the Eurostat databases. The corporate tax revenues are examined in Excel through mathematical methods. The cluster analysis is performed in the R environment, using the packages cluster, NbClust, nFactors, gg dendro and rgdal.

3. RESULTS AND DISCUSSION

3.1 Analysis of income inequality

The left scale of the graph defines the score – the value of the Gini coefficient difference before and after providing the social benefits and transfers, in the years 2007, 2009 and 2018. The right scale of the graph defines the bar marking. It shows the average values of the Gini coefficient and the total social benefits and transfers in the country. Uncoloured parts of the bars show the resulting Gini coefficient (Figure 1).

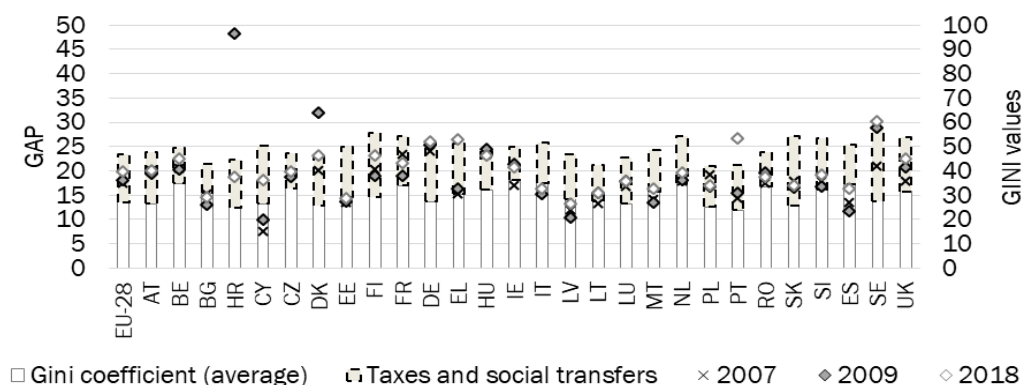


Figure 1. Average value of the Gini coefficients

Source: Authors' own elaboration

The Gini coefficient before providing benefits and transfers (*Gini_Before*), as one of the indicators of income inequality rates, increased slightly in the EU-28 in years 2007–2018, from 47.48 (2007) to 50.14 (2018). The average values are recorded in the range from 46.95 (2007) to 50.47 (2014). The maximum level of the coefficient was recorded in Greece at 60.60 (2013) and the minimum level was recorded in Cyprus at 37.30 (2007). The below-average values of the coefficient were observed in Austria, Belgium, the Czech Republic, Finland, Malta, the Netherlands, Slovakia and Slovenia. It can be assumed that the income inequality among the population within

the EU-28 is the lowest in these eight countries. The value of the adjusted Gini coefficient (*Gini*), with the EU-28 average at 29.92, ranged from 29.68 (2007) to 30.43 (2014). The maximum level was recorded in Lithuania at 38.90 (2007) and the minimum level was recorded in Slovenia at 22.70 (2009). The below-average values were observed in Austria, Belgium, the Czech Republic, Denmark, Finland, Malta, the Netherlands, Slovakia, Slovenia and Sweden throughout the entire period. The system of social benefits and transfers is an important way of reducing the income inequalities. The number of countries with the income inequality below the EU-28 average has increased by Denmark and Sweden, based on the transfers and social benefits provided. On the contrary, the smallest difference between the coefficients was recorded in Cyprus.

According to the comparison, we can claim that the countries have more often the serious income inequalities that are not sufficiently offset even by a system of benefits and transfers. Although the system of benefits and transfers is increasingly focused on income redistribution, the outputs are not sufficient to offset the increasing income inequality. Similar findings are shown by H. Immervoll and L. RIcharson (2011).

3.2 Analysis of the tax progressivity index

The following table shows the results of the calculation of the tax progressivity index for selected types of taxes in individual countries, determined as an average of values (Table 2).

Table 2. The tax progressivity index within selected types of taxes

Country	Indirect taxes	Value added tax	Excise taxes	Direct taxes	Individual income tax	Corporate income tax
AT	1.150	1.119	0.781	1.309	1.282	1.887
BE	1.216	0.974	1.146	1.413	1.353	2.320
BG	1.073	1.020	1.045	1.040	1.315	1.935
HR	1.610	1.807	3.365	2.481	1.765	6.712
CY	1.608	1.622	2.284	1.593	5.529	1.362
CZ	1.855	1.839	1.172	1.138	1.205	1.556
DK	0.906	0.809	0.954	1.721	1.754	2.732
EE	1.261	1.281	2.123	1.366	1.243	1.912
FI	1.961	1.856	2.119	1.339	1.464	3.938
FR	1.614	1.090	2.277	2.162	2.201	2.960
DE	0.920	0.995	0.581	1.522	1.369	1.871
EL	0.415	0.811	0.814	0.456	0.772	2.449
HU	1.786	1.986	0.735	3.440	3.153	6.378
IE	0.687	0.701	1.054	0.703	0.577	1.412
IT	3.019	2.562	8.063	1.897	2.667	7.975
LV	1.547	1.674	0.940	1.568	1.245	3.543
LT	0.965	1.030	1.068	2.316	2.129	2.983
LU	0.944	1.280	0.705	1.171	1.543	0.494
MT	0.810	0.945	0.796	1.165	1.174	1.173
NL	1.324	1.236	1.543	1.761	1.768	5.011
PL	0.870	0.741	0.956	0.917	1.075	1.045
PT	2.131	2.582	3.102	3.808	5.543	3.616

RO	1.301	1.184	1.534	1.344	1.451	1.659
SK	1.047	1.132	0.642	1.752	1.456	2.331
SI	1.391	1.223	2.671	1.873	1.177	7.638
ES	3.439	4.895	1.557	3.470	1.052	11.802
SE	0.967	1.062	0.561	0.930	0.929	1.169
UK	1.301	1.481	0.913	0.875	0.857	1.108

Authors' notes: the grey colour in the category of direct taxes shows their progressive character

Source: Authors' own elaboration

From the point of view of the tax progressivity index of direct taxes, their development is monitored in two ways: separately for the individual income tax, where literature assumes its regressive character and separately for the corporate income tax, where literature assumes its progressive character. However, this fact may be disrupted by exogenous factors. In less open economies, there is a risk of shifting the tax burden from corporate income tax to mobile factors, in particular to labour, by which the tax loses its progressive character. When evaluating the income generated by individual income tax separately, their regressive character is present only in four Member States, namely in Greece, Ireland, Sweden and the United Kingdom. In the EU-28, there is a higher tax progressivity in the corporate income tax. From the point of view of the tax progressivity index of indirect taxes, both progressive and regressive developments are documented. In the case of VAT and excise taxes, the tax burden is expected to be passed on to customers. These taxes are due to their lower consumption burden predominantly of regressive character (although the exemption of lower tax rates on basic commodities leads to a decrease of VAT regression and vice versa, in the case of excise taxes on luxury commodities, it is assumed their progressive character). In the EU-28, there is recorded a higher VAT progressivity in 21 Member States. A higher tax progressivity is also recorded in excise taxes. The effect of excise taxes varies according to their use on luxury goods or goods of basic consumption and on consumer preferences.

According to OECD (2012), the redistributive effect of taxes varies in individual countries less than indicated by large differences in the ratio of selected tax revenues to GDP. Some countries with higher tax rates report low tax progressivity and that is due to three main reasons: the tax mix favours excise taxes and social security contributions instead of more progressive individual income taxes; the progressiveness of tax rates is limited for most tax categories; and the legal progressivity of taxation weakens the tax expenditures that are most used by high-income economic groups.

3.3 Cluster analysis

According to the D-index, the TraceW index and the Rubin index algorithms, there were determined four clusters that represent the optimal number of clusters. The EU-28 countries were grouped based on the variables assessing income inequality and on the analysis of development of tax progressivity rate of individual types of taxes. The map visualization shows the results of cluster analysis (Figure 2). The values of average variables for individual indicators in each cluster are shown in the table (Table 3).



Figure 2. Cluster map EU-28

Source: Authors' own elaboration

Table 3. Categorization of EU-28 based on clusters and indicators examined

Countries	cluster 1	cluster 2	cluster 3	cluster 4
	HR, HU AT, BE, FR, DE, IE	BG, EE, LV, LT, PL, RO, EL, IT, PT, ES	CY, CZ, MT, SK, SI, FI, LU, NL	DK, SE, UK
<i>Progressive</i>	1.002	1.482	1.474	2.049
<i>Gini_Before</i>	50.23	50.53	44.16	52.65
<i>Gini</i>	28.68	33.98	26.65	28.13
<i>CTR</i>	2.13 % HDP	2.08 % HDP	3.33 % HDP	2.74 % HDP
<i>Growth</i>	1.32 %	0.95 %	1.74 %	1.15 %
<i>GDP_PC</i>	27,981.45 EUR	14,033.94 EUR	29,922.96 EUR	38,425.32 EUR
<i>Unempl</i>	8.86 %	11.73 %	7.62 %	6.77 %

Source: Authors' own elaboration

The highest index of tax progressivity of the corporate income tax is recorded in *cluster 4*, made up of three countries. The index level is 2.04. As a result of the methodology used to calculate this index, the corporate income tax in these countries can be considered as progressive. The progressive character is also supported in other clusters (although the minimum value in *cluster 1*

reaches a level of only 1.002, which is to say about its proportional character). T. Hayes and D. Vidal (2005) assessed the relationship between the value of corporate tax revenues and income inequality. The authors confirmed that individual countries are able to influence the income inequality of different economic groups through a fiscal policy and through the tax system. The countries with higher levels of provided aid in the form of benefits and transfers system have a lower level of income inequality through higher tax revenues. The negative correlation between the Gini coefficient and corporate tax incomes in relation to GDP is proven in all clusters based on the assumptions set.

The maximum level of average corporate tax revenues to GDP is recorded in *cluster 3* at 3.33 % of GDP with the performance of economies at 29,922 EUR and the highest average economic growth (1.74 %). Fiscal policymakers have claimed many times that they are facing a compromise between an economic growth and an even distribution of income. T. Rhee (2012) believes that there is a negative relation between progressivity of tax incomes and economic growth. Similarly, according to J. Ostry et al. (2014), the income inequality leads to a low and unsustainable economic growth. The correlation between income inequality and economic growth is sceptical from the literature point of view. The economic theory inclines to believe that the more aggressive income redistribution, usually through more progressive income taxes, leads to a lower economic growth. L. Dao and T. Van Binh (2013) believe that the progressivity of tax incomes is beneficial for reducing inequality and income diversification, as it causes an increase of GDP. P. Hong et al. (2014) observe a positive correlation between a development of the Gini coefficient and economic growth. According to them, this is partially driven by tax revenues. This fact is confirmed only in the case if the Gini coefficient does not increase above the level of 42. Under certain circumstances, the income inequality may exist in conjunction with higher economic growth, but only if the level of income inequality is low. The lower income inequality associated with the higher economic growth is recorded in *cluster 3*. The higher income inequality associated with the lower economic growth is recorded in *cluster 2*. There is a positive correlation between income inequality and unemployment rate (e.g. Sharpe and Zyblock, 1997 or Cysne, 2004). The higher unemployment rate associated with the higher inequality rate is reported in *cluster 2*. The results of this relation are evaluated in the literature also by an alternative approach. A positive correlation between mentioned indicators was demonstrated by R. Aaberge et al. (2000). The authors claim that in a period in which the unemployment rate has risen sharply due to the exogenous factors in the countries, the standard income inequality rate determined by the Gini coefficient was surprisingly stable. The reason for this stability was a system of increasing social benefits and transfers in unemployment, which neutralized the unequal distribution of income.

CONCLUSION

In the case of the tax system assessment from the point of view of the fairness of taxes, it is legitimate to monitor how the tax system changes the final distribution of income in society. In particular, the Gini coefficient is observed in this paper to compare the income inequality between the EU-28 Member States, although of course, the income inequality has many other dimensions. Based on the analysis carried out in the EU-28 Member States, the progressive character of the corporate income tax has been proven in almost entire monitored period in almost all countries. The corporate income tax, assessed through the tax progressivity index, has a potential to impact the level of the income inequality by its progressive character. It is important to add that its progressive character may be partially disrupted in conjunction with other exogenous factors. On one hand, based on the above stated findings and relations, this tax has a potential to affect the level of income inequality and thus, by its redistributive character, impact the income diversification. On the other hand, the absolute values of the corporate tax incomes in the EU-28 Member States are among the lower, which may, in conjunction with other exogenous variables partially disrupt the character of this tax. In order to assess the redistributive role of the corporate income tax, a cluster

analysis was carried out. The analysis assessed the similarities between the EU-28 clusters according to the progressivity of corporate income tax and selected variables reflecting the country's income redistribution. It has been shown that countries with a higher level of aid in the form of a system of benefits and transfers, in combination with higher tax revenues flowing into national budgets, not excluding the corporate income tax, report a lower level of income inequality. Based on the set assumptions and analysis carried out for the examination of the progressive character of corporate taxes, the assumption of the hypothesis that the progressive character of corporate tax incomes represents a factor influencing the redistribution of incomes, can be considered as confirmed.

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