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CLASSIFICATION OF EU COUNTRIES IN THE CONTEXT OF CORPORATE INCOME TAX

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Abstract

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Taxes are an integral part of human society, regardless of the economic, cultural and political disparities between the countries. Income taxes of legal entities represent significant part of the budget, what is the reason for their timeliness and public discussion. The aim of the paper is a classification of the EU countries into economic groups and an assessment of the grouping these EU member states based on common characteristics in the area of corporate income taxes. Common features are determined by the structure of selected macroeconomic indicators: public debt, government budget balance, the overall tax burden, economic performance, nominal and effective tax rate. The analysis compares a range of methodological approaches of hierarchical (Ward linkage and median linkage), and non-hierarchical clustering (k-means clustering and fuzzy cluster analysis). The results of cluster analysis grouped the monitored countries into five clusters based on common characteristics as the corporate income tax rate, economics performance and the level of public debt. The result of the analysis shows that despite of ongoing there are still differences present, which are present in the ratios of countries' development as well as in the economic policies of the particular countries.

Keywords: tax revenues, public spending, overall tax burden, economic performance, tax rate

INTRODUCTION

Despite its long existence in the tax system, corporate income tax definitely cannot be described as durable and unchanging tax policy institute. The corporate tax aggregates economic, political and social aspects, and is subject to frequent changes and adjustments, and therefore it is necessary to monitor its developments in national conditions. The object of observation must be extended to the European level, since individual countries show significant differences. Corporate income tax as an economic and a political tool significantly influences the location of companies and has a direct impact on domestic and foreign direct investments (Barrios, *et al.*, 2009). What is unusual in this context are not the methods of abroad gain spill over to optimize the tax liability of businesses and finding states with favourable tax treatments, but rather the criteria to monitor the level of the general taxation. The tax burden of legal entities is conditioned by cooperation of many quantitative and qualitative determinants. Their impact may be reflected directly through tax structure itself, or indirectly through the behavior of taxpayers (Karagöz, 2013; Vasiliauskaite & Stankevicius, 2015; Kubátová & Říhová, 2009 etc.). The level of tax burden is the result of measurable determinants both in a short as well as in a long-term period: such as the tax rate, the tax base, tax evasion in the field of direct taxes, illegal economy, the extent of economic support through the tax expenses, the relation between the tax base, GDP and economic cycle, the effect of GDP growth rate and fiscal imbalance or debt service of the country (Vasiliauskaite & Stankevicius, 2015; Kubátová & Říhová, 2009).

The presented paper therefore focuses on identification, analysis and assessment of EU

countries groups, which show the common characteristics in the field of corporate taxation in the context of tax system's convergence.

The goal of this paper is to create and choose an economically transparent and meaningful categorization of the EU countries, taking into consideration selected segmentation criteria and at the same time analyse the level of convergence through the homogeneity of corporate taxation using cluster analysis.

LITERATURE REVIEW

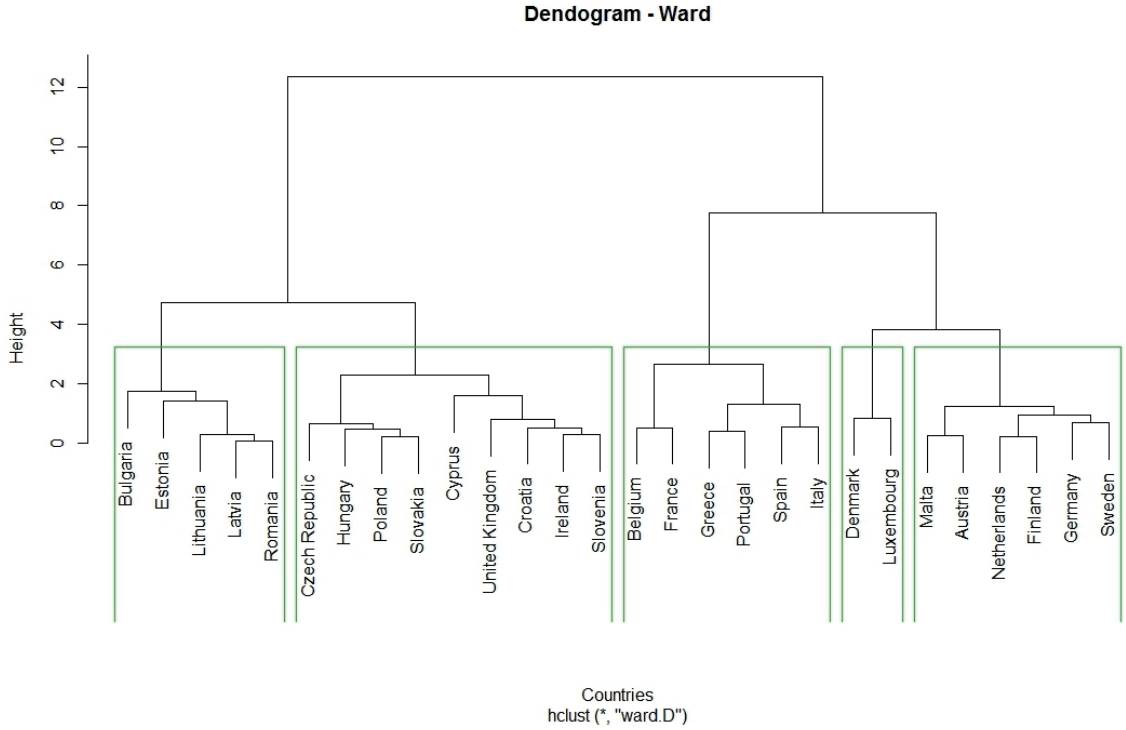
Corporate income tax currently represents the highest percentage of the total state budget revenues. The support of domestic and foreign investment is provided by the reduction of corporate taxes and especially the removal of selective advantages and breaks that can cause a deformation of the business and economic environment. Studies of Johansson, *et al.* (2008) showed that selective tax support of investment in small business is not globally effective, and does not lead to a total investment increase in the economy. Business investments are indirectly proportional to corporate taxation, through the user costs of capital (Rosen, 1992). Schwellnuss, *et al.* (2008) and Arnold, *et al.* (2011) focused on assessing the impacts of corporate income tax on productivity and investment at the company level, while Vartia (2008) did so at industry level, because the negative dependence between investment and the tax rate for corporate taxation was also demonstrated at industry level. All the observations showed that the effect is minimal. An important role is played by the specific tax rate. The higher tax rate on corporate income, the more negative impact on investment has its further increase. A similar view is held by Yagan (2015), who tested the stimulation of business investment and income increase from work. He found that tax cuts resulted in no changes in business investment or employee remuneration. The nominal, effective and average tax rates are used not only by investors, but to a large extent by politicians and economists (Bánociová and Pavlíková, 2013). As mentioned by Devereux and Griffith (1998, 2003), there are many ways and methods based on the prescribed methodology to determine effective tax rates. Jensen and Rosenzweig (2015) designed an empirical study in which they observed whether and to what extent an unexpected increase of tax rates in one country affects the final tax return. They found that an increase led to a worldwide tax revenue increase declared by global multinationals. Lee and Gordon (2005) studied the impact of fiscal policy on growth rate of the country. They found that corporate tax rates show a negative correlation with average economic growth. They conclude that the increase in tax rates for legal entities resulted in future economic growth rates reduction in the country, as affirmed by Auerbach (2007), who monitored the profit ratio in companies converted to GDP and average tax rates. The result of his analysis is a decline in profits and an average tax rates increase. In addition to tax rates, there are other factors impacting of short-term and long term tax revenues development. Livermore (2004) examined dependence between GDP and tax revenue. He pointed out that the tax base is calculated only from positive income. Kubátová and Říhová (2009); Bayer (2011); and Michalski (2008) using a panel regression analysis and an econometric model, indicated a positive impact of GDP on the tax. The mutual dependence between GDP and tax burden in the country was also examined by Vasiliauskaite and Stankevicius (2015), who revealed through a cluster analysis that the level of the indicator GDP per capita in the country affect the positive effects of the corporate income tax reduction. The benefits in the form of tax revenues are also affected by effective and economic management of the government. This can be monitored via indicators, the government budget balance and the public debt (Dráb and Mihóková, 2013; Raisová, 2015; Mura, *et al.*, 2015; Hakalová, *et al.*, 2014). The impact of a causal relationship between fiscal imbalance and tax burden was discussed by Krogstrup (2002); Eijffinger and Wagner (2002) in a regression analysis. They found that a one percent increase of the debt service indicator relative to GDP leads to a tax burden increase in the country by an average of 0.2 percentage point in the future. In addition to the above mentioned quantitative indicators, there are many other factors which influence the development of the corporate income tax. These can include geographic location of the state, which has an impact on several tax-legal issues of the corporate income tax structure. At the same time, in practice there is often a tax competition between geographically closed countries and those respond to the legislative changes of tax and business environment more strongly. We can also mention other factors that affect the adjustment of corporate income tax, such as political climate and priorities of the representatives of governmental and legislative bodies, states' participation in various integration groupings of economic and political orientation, the quality of the business environment or economic development in the country, as claimed by (Šoltés and Gavurová, 2013; Mura and Buleca, 2012; Michalski, 2009; Litavcová *et al.*,2015; Glova, 2013; Boda, *et al.*, 2014).

MATERIALS AND METHODS

The analysis is provided with an emphasis on economic performance, indebtedness and the tax context. The selection of variables is adequate for an assessment in the area of corporate income taxation. For our purpose the following six indicators have been chosen:

- Economic performance–expressed as the indicator GDP per capita at current prices in €,
- Total tax burden–expressed as tax allowances II (as the ratio of income from all kinds of taxes and social contributions in the form of taxes to GDP in %)
- Nominal tax rate on corporate income (NTR)–expressed in %,
- Effective tax rate on corporate income (EATR)–expressed in %,
- Government budget balance–deficit/surplus of the state budget of the specific fiscal year, expressed as a share of GDP in %,
- Public debt–expressed as the ratio of debt to GDP in %.

The basis for the indicators selection has been theoretical knowledge of Barro (1979); Devereux, Griffith and Klemm (2004); Clark (2003), who investigated relations and the action of the factors on the area of corporate tax income, as well as the retroactivity of tax on factors in the future. When deciding on the number of clusters in data transformation, we have used factor analysis to pre-process the data and reduce the number of variables to two factors also confirmed by provided tests: Parallel Analysis, Optimal Coordinate and Acceleration Factor (Costello and Osborne, 2005). Reduction of variables into two factors was tested using the Dindex test and Hubert's statistics, which resulted in five clusters. Hubert's statistics clearly confirmed the number of used clusters, while Dindex results were not as significant (significant values were confirmed at 7 clusters). Following this assessment, the data transformed to z-score were processed through the cluster analysis method using both a traditional hierarchical cluster analysis with Ward's linkage (in practice the most commonly used) and the median method, and using the routine hclust (). The following non-hierarchical methods were used: k-means and fuzzy c-means, which is unique in comparison to the other methods and enables the revelation of so-called classification indeterminate objects using kmeans () and fanny () (Charrad, *et al.*, 2012). The Euclidian metric was used in all the methods (Halkidi, *et al.*, 2001; Everitt, *et al.*, 2001). Analyses were conducted in the statistical language R in the EU countries for the year 2014 using psych, GPArotation, nFactors, cluster and NbClust. Quantitative data were taken from Eurostat databases. Cluster indexes were re-implemented into the output of multidimensional scaling and evaluated from the view of mutual distribution of the countries. This paper presents only the values of resulting models.



1: *Dendrogram created through Ward's method of cluster analysis for year 2014*
Source: Graphical output from R-programme

Hierarchical and non-hierarchical clustering analysis of income tax

Ward's hierarchical clustering method

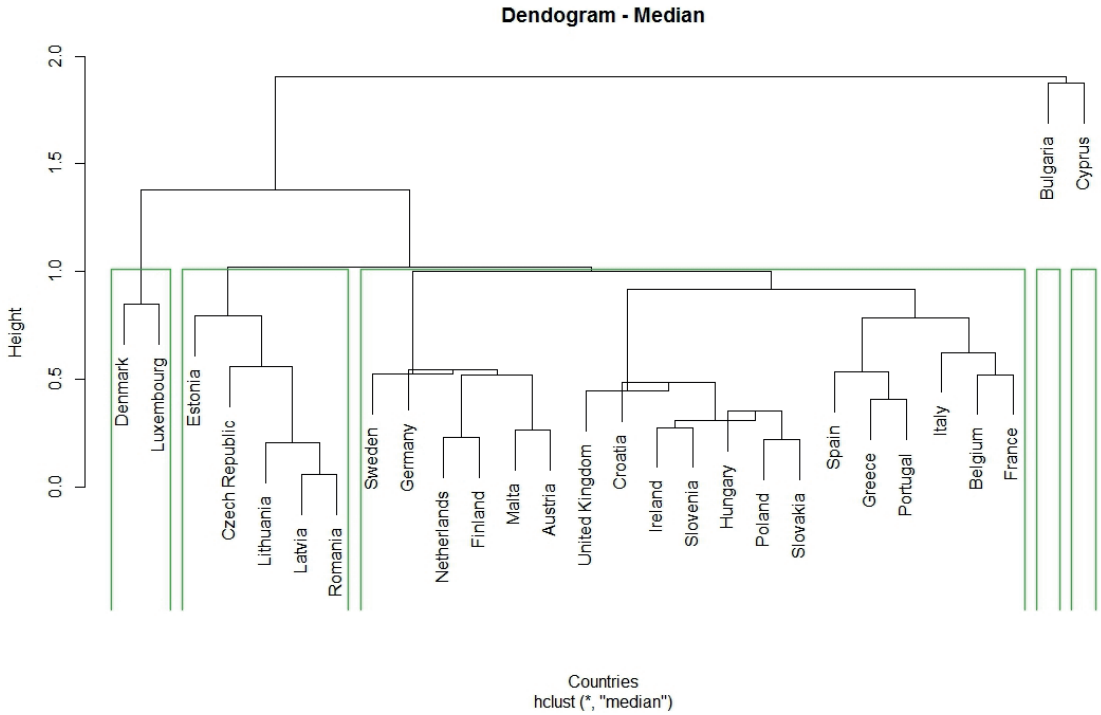
Ward's method results in a dendrogram, which was divided into five clusters obtained by function NbClust and command cutree. (Fig. 1) Clusters consist of about the same quantity except for the fourth cluster, which consists only of Luxembourg and Denmark. On the other hand, the most populous cluster consists of the Czech Republic, Poland, Cyprus, Hungary, Slovakia, Croatia, United Kingdom, Ireland, and Slovenia. The criterion of mutual parallel of the countries of the each cluster can be evaluated positively. The cluster countries are similar to each other and none of the clusters overlaps another one, nor did any two clusters have a common intersection. Therefore, the results show a satisfactory conclusion.

Median hierarchical clustering method

The second monitored method is a hierarchical median method one which we also identified by the NbClus function. In comparison to Ward method, we conclude that although the recommended number of clusters is the same in both methods, namely five, the distribution of the countries in these clusters is diametrically different. Using median method in (Fig. 2), there were two clusters consisting of only one country, namely Bulgaria and Cyprus respectively, whereas when using Ward method, these countries are part of the first and second cluster. The reason for the separation of the countries in the median method is following the quantity of clusters while Ward's method produces clusters of approximately the same size. The third cluster is the most numerous one and consists of Sweden, Germany, Netherlands, Finland, Malta, Austria, United Kongde, Croatia, Ireland, Slovenia, Hungary, Poland, and Slovakia. On this basis we conclude that clustering of Member States has been provided mainly on the basis of their mutual similarities and differences, and the choice of hierarchical clustering method affected the result only to a small extent.

K-means hierarchical clustering method

Before using the k-means method, we determined the number of clusters to be formed from the objects. For the purposes of comparison, we used the k-means method and the method of undetermined aggregation (fuzzy cluster analysis). In accordance with our request, even within k-means method we assumed the distribution of the countries and determined the optimal number of clusters. We concluded that even in this case, the countries should be divided into five clusters. The results of k-means method are five clusters with a quantity of eight, six, six, six and two EU Member States. (Fig. 3)



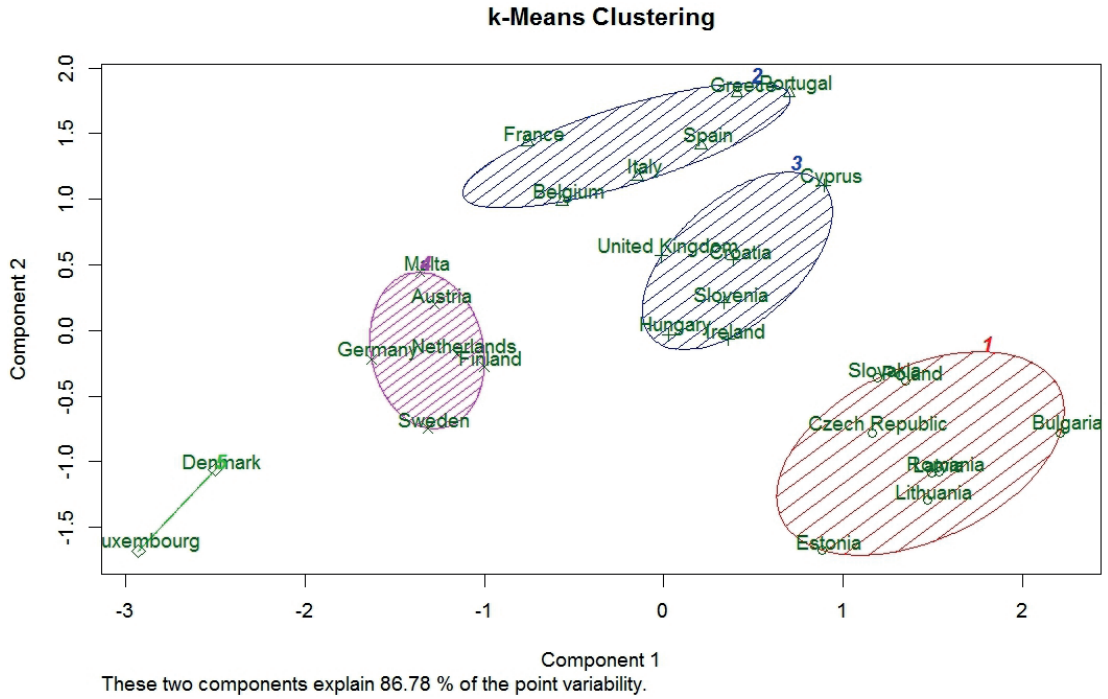
2: *Dendrogram created through the median method of clustering*
Source: Graphical output from R-programme

Non-hierarchical method of uncertain clustering (fuzzy cluster analysis)

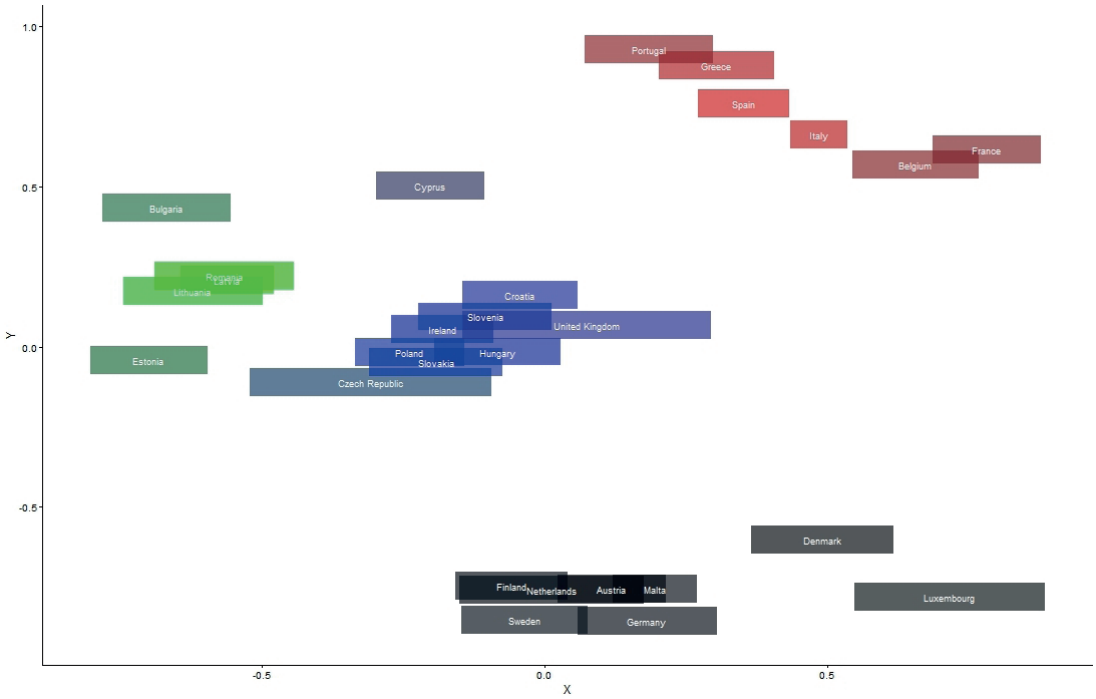
The fuzzy c-means method allows for the object - the country - to belong to all clusters simultaneously. This method was used to determine so-called classification unsure/indeterminate countries. The analysis was compared with multidimensional scaling (Fig. 4). The countries showed relevant signs of belonging to multiple clusters. In the case of classification into five clusters, the most clearly clustering inclusion was shown by Latvia with a value of 86.26 %, and Romania with a value of 84.33 %. The country with the lowest level of inclusion (18.19 %) was Estonia, closely followed by Cyprus (27.16 %). In the previous analyses, Denmark and Luxembourg were determined as a separate cluster. On the other hand, Slovakia was on the boundary of clusters identified by earlier methods. Using Ward's and median method, as well as the k-means method, Slovakia was clustered together with Hungary, Czech Republic, Poland, Croatia, United Kingdom, Ireland, Slovenia, and Cyprus. What is more interesting is that within Ward's method, there were 2 clusters, within median method, there were 3 clusters, and within k-means, there was 1 cluster. On the basis of the results we can clearly *conclude* that although the countries belong to different clusters when different methods are used, no differences within clusters were found. One specific group was formed by Luxembourg and Denmark, which formed cluster 4 according to Ward's method, cluster 1according to Median method, and cluster 5 according to k-means.

Summarizing of the structural elements of the corporate income tax

Through the evaluation of the structural elements and incentives influencing corporate tax liability in the EU countries, we attempted to clarify the national specifics in the individual clusters. Classification of the clusters was made on the basis of the above mentioned methods. Although the results of the representation of countries in clusters were identical, there were variations in the positioning of the individual clusters. The summary was performed using Ward's method, since it is the most commonly used and most accepted method by the scientific community (Vasiliauskaite and Stankevicius, 2015; Barro, 1979; Devereux, Griffith and Klemm, 2004; Clark, 2003). The first cluster consisted of five EU countries (Bulgaria, Estonia, Lithuania, Latvia, and Romania). This cluster was similar but not entirely homogenous in multiple structural elements of the corporate income tax. The average tax rate in this cluster is 16.4 % (NTR), alternatively 14.3 % (EATR), which is the lowest among all the clusters of the classified EU Member States. The tax rate value in this cluster is between 10 % (Bulgaria, which tries to attract foreign investors using this rate) and 20 % (Estonia). All the countries have the basic rate value except for Lithuania, where there is also a reduced 5 % rate for agricultural and small businesses. A unique member of this cluster is Estonia, where we highlighted the significant difference in the method of taxation. Corporate profits in this country are taxed only when distributed. In



3: *Graphical representation of cluster analysis of EU member states by k-Means Clustering*
Source: Graphical output from R-programme



4: *Multidimensional scaling of the EU member states by fuzzy cluster analysis*
Source: Graphical output from R-programme

the cluster we also state compliance in the policy of tax impulses that are mainly focused on Research and Development (Bulgaria at 50 %), employment increase and promotion of small and medium enterprises. In Latvia, the tax benefits apply to income earned in specific economic zones (Liepaja, Rezekne) and ports (Riga, Ventspils). In the case of a loss in this cluster, it loss can be transferred into future tax years for the next five consecutive years (in Lithuania up to 70 % of taxable income). The second cluster consisted of multiple countries (Czech Republic, Hungary, Poland, Slovakia, Cyprus, United Kingdom, Croatia, Ireland and Slovenia). The average tax rate on corporate income tax in this cluster is 18.6 % (NTR), alternatively 18.4 % (EATR). The countries of the cluster have a real tax rate in from 12.5 % in Ireland and Cyprus, to 22 % in Slovakia. Other countries: Czech Republic, Hungary and Poland have the same 19 %, Slovenia 17 %, Croatia 20 % United Kingdom 21 %. A deduction for losses in previous years is allowed only in Hungary, Czech Republic, and Cyprus. A deduction for losses during the period of *five consecutive tax* years, but not back, is allowed in the Czech Republic, Poland, Cyprus, and Slovakia. Capital incentives and tax breaks are aimed mainly at research and development, small and medium enterprises, investment in technology, and the creation of new jobs. Since 2011, Cyprus has a compulsory minimum tax on registered legal entities in the amount of € 350, similar to the Slovak tax license, which ranges from 480 € to 2,880 €. One unique example of the cluster is the United Kingdom, where the tax rate depends on the given tax period. It is described as the period between April 1 and March 31 of the following calendar year. The basic rate of corporate income tax for the fiscal period from April 2014 was 21 % and from April 2015 a tax rate has been reduced to 20 %. Similarly to Spain or Cyprus, there is an established so called patent box (which is the taxation of intellectual property). In regard to the geographical position of Cyprus as an island state, there is a special regime of taxation for freight shipping sector. In the Czech Republic, there is a reduced rate of 5 % for pension funds and other selected types of funds, and in Hungary, the reduced rate is 10 % (additionally, there is also a local business tax of 2 %, the choice of which is in the discretion of the municipalities). Croatia supports further development of business by a reduced tax base by the amount of reinvested earnings. Ireland applies a special regime in the maritime sector, the so-called tonnage tax, similarly to Slovenia (where companies with revenues from mining oil and natural gas). The third cluster (Belgium, France, Greece, Portugal, Spain and Italy) includes older member states. These are countries with the highest tax rate, ranging from 26 % to 36.1 %. The highest corporate tax rate within EU28 is in France 36.1 %, followed by Belgium 34 %, Portugal 31.5 %. 30 % Spain, Italy and Greece 27.5 % 26 % (increased from the initial rate of 20 %). Interestingly, all states except for Belgium give corporate entities the option of group taxation and

the establishment of consolidated groups for tax purposes. Reverse loss deduction in the past is allowed only in France (60) and the deduction of loss in future years is allowed largely indefinitely (Belgium). Time limits are stipulated only Spain, Portugal, and Greece (up to 5 years). The position of Greece was fundamentally changed by the financial assistance package from the IMF and the EU. Strict economical measures of fiscal consolidation were reflected in all tax institutions. The most significant tax reform was performed in the summer of 2013. The situation is similar in Portugal, which has been in recovery mode agreed upon with the European Commission, ECB, and IMF. The Portuguese tax system also applies a state surtax on corporate income taxes, staring in 2014. It is based on the amount of corporate incomes and it ranges from 3 % to 7 %. Spain introduced the 25 % reduced tax rate to support the economy (income for small businesses providing the allowances for staff training in new technologies) and, similarly to Belgium, uses tax credits to implement research and development and to introduce innovations (so-called patent box). Tax credits can be acquired by companies operating in less developed areas of Italy, which also use a special regime for small and medium-sized enterprises. The fourth cluster is the smallest and includes (Denmark and Luxembourg). These countries are characterized mainly by a high tax rate, which is 29.2 % in Luxembourg and 24.5 % in Denmark. Denmark introduced a comprehensive tax reform implemented from 2013 to 2023. A general reduction of tax burden has been and will mainly continue to be compensated by cutting public spending. In 2013, a plan of economic growth for the years 2013 and 2016 was introduced. The plan includes a continuous reduction in the rate of corporate income tax from 25 % (2013) to 24.5 % (2014), 23.5 % (2015) up to 22 % of the tax base (2016). Profits from the mining of oil and natural gas from the North Sea are completely tax exempt. Luxembourg regularly accumulates high revenues from taxes on corporate income, despite the very small size of its territory. The fifth cluster consists of five states (Malta, Austria, Netherlands, Finland, Germany and Sweden). The average tax rate of corporate income tax in this cluster is 29.5 % (NTR), alternatively 27.8 % (EATR). In all countries of this cluster there is a high rate ranging from 22 % to 35 %. The tax rate in Malta is the second highest in the EU28 with the amount of 35 % of total tax base. Austria and the Netherlands have the same rate of 25 %. Finland has a slightly lower tax rate of 24.5 %, and is one of the EU Member States with the highest tax burden (53.7 % of GDP). Regarding the corporate income tax rate in Germany, a decreasing trend can be identified with a value of 29.8 % of tax base in 2014, and in Sweden, there is a classic system with a broad tax base and relatively low tax rate of 22 %. Tax incentives of the governments are focused on research and development, innovation, education, sport, and environmental projects. Malta supports 65 % of all activities in case that the investments are distributed in the island of Gozo. Reverse loss deduction in the past is allowed in Germany and Netherlands within a single tax year, and without a time limit in Malta and Austria (max.75 %). Deduction of losses in future years with time limits is enacted only in Finland (10 tax years) and in Netherlands (9 tax years).

DISCUSSION

The analysis showed that despite the continued integration within the EU, there are still differences between Member States. These differences are present in both the indicators of country sophistication, and in the economic policies of individual governments. Vasiliauskaite and Stankevicius (2015) argue that "In short-time perspective governments generally tend to rally on the means of the increase of taxes, which look more attractive administratively. However, this step usually results in complicated, ineffective and perverse tax system that not only does not bring presumptive revenue, but also the weaknesses stimulus to work and save. It prevents from economic growth and prices inflationary pressure of forms prevalent uncertainty and lack of trust in the future. Schmit-Faber (2006) state that in each country, there should be a tax system that would not increase a tax rate and yet, the tax revenue would grow faster than the tax base, which can only be achieved by a stable, transparent and balanced tax system. Practical experience showed that relatively low tax rates had greater economic and social benefits for the country. This was also confirmed by our analysis, when the tax rate congregated the countries at different clusters. In the first and second cluster, the tax rate ranged from 10 % to 21 % in the third and fifth cluster the rate ranged from 22 % to 36 % and the fourth cluster, which consisted only of two countries, the rate ranged from 24 % and 29 %. We cannot forget that the European Union consists of countries with different levels of economic development, and therefore also different principles of national tax systems. Regarding the creation of tax systems, to provide adequate tax revenues in the countries it is necessary to take into account other macroeconomic factors. Our analysis confirmed that in addition to tax rate, the clustering of countries was largely affected by: GDP indicator, the overall corporate tax burden, the government budget balance, and public debt. On the basis of the indicators, we successfully created five clusters of countries with approximately the same quantity. One exception was the fourth cluster, which consisted of Luxembourg and Denmark, with economic performance (GDP / per cap.), far exceeding the EU28 average (from € 33,300 - Denmark up to € 83,400 - Luxembourg). Luxembourg (0.6 % of GDP) had a surplus in 2014. In the first cluster, the public debt of countries was at 35 % of GDP. In regard to to financial management,

these states applied fiscal discipline and their deficits never exceed the limits stipulated by the Maastricht criteria (3 % GDP). The second cluster was characterized by the worst economic position in public debt that can be clearly attributed to Ireland and Cyprus, as their public debts exceeded 100 % of their GDP. The economic performance of other countries was below-average, while the highest value was reached in the United Kingdom (€ 29,600) and Ireland (€ 35,600), which have a tax system with similar structure, and the lowest value was reached in Hungary (€ 9,900). The countries of the third cluster achieved a high value, over 102 % of GDP, due to the participation of Spain, Portugal, and Italy. These are countries with large macroeconomic problems, instability of public finance, and a persistent debt crisis. The highest public debt after Greece (nearly 175 % of GDP) was in Portugal (128 % of GDP) and Italy (127.9 % of GDP), whose values are the highest in the whole EU. All countries of this cluster have a public debt exceeding the Maastricht criteria (60 % of GDP). In the last and fifth cluster, the requirement of Maastricht Criteria regarding public debt was respected, except for Austria (81 % of GDP), Germany (77 % of GDP), and the Netherlands (69 % of GDP), which exceeded the set limit. The tax burden in this cluster is 48.20 %. Analysis showed that in addition to the rates, the amount of tax revenue is also affected by other macroeconomic factors. Mutti (2003); Bretscher and Hettich (2002); Rodrik (1997); Charrad, *et al.* (2012); Tušan, *et al.* (2013) have a similar opinion, and their works state that while watching the amount of corporate income tax it is necessary to first understand and analyze decisive factors, which together with tax rates play an important role and affect the amount of tax income. The process of integration and harmonization of policies of the countries is long-term, dynamic, and unique. Disparities can have negative consequences, especially for countries of the European Monetary Union that have adopted the single currency and a single monetary policy without the launch of a fiscal union.

CONCLUSION

In conclusion, we hold that within the 28 EU Member States, we identified gaps and imbalances in determination of the corporate income tax, which can be described as a tax competition phenomenon within the integration groupings. The main objective was to create economically efficient and transparent categorization of EU countries and to assess the convergence process in the field of corporate taxation. The categorization was performed using hierarchical method (Ward's method and Median linkage method) and non-hierarchical method (k-means clustering and fuzzy cluster analysis). Ward's method results are deeply discussed because of its preference in the socio-economic sciences. Our analysis proved that with exception of tax rate, that moved within the interval from 10 to 36 per cent, these variables have been significant for the clustering of the particular countries under investigation: GDP measure, overall corporate tax burden, the government budget balance, and public debt. Based on these variables five clusters of the particular countries with approximately similar frequency are selected. The only exception is the fourth cluster, where Luxemburg and Denmark are clustered, with the economic performance measured by GDP on capita highly oversized the EU-28 mean (from 33 300 € for Denmark till 83 400 € for Luxemburg). The result of cluster analysis shows differences in corporate taxation within European countries. The performed analysis proved that despite the ongoing integration within the EU, differences between EU member countries persist. The differences result from the different macroeconomic situations of the countries, various economic policies, and diverse tax legislations. In accordance to formulated main objective of this research, analysis confirms that the certain level of convergence of corporate tax system exist, but in principle only in two separate blocks (the old and the new EU member countries). Cluster analysis results are beneficial, because through its application it was able to verify, that the level of convergence in the tax system is not sufficient and there is still space for implementation of harmonization measures.

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