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CONSIDERATIONS ON TAX SYSTEMS AMONG OECD COUNTRIES

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Abstract:
The functioning of modern states cannot be conceived without taxation. However, there are huge differences from one country to another in terms of the degree of taxation of the economy and the structure of taxes that bring revenues to the budgets of public authorities. Our article makes an analysis of the literature on optimal taxation. Ideas on the progressiveness of income tax, flat taxation of capital gains, ways of taxing property, different taxation of certain categories of goods and services, etc. are reviewed. The empirical study on OECD countries identifies some correlations between five categories of taxes and several socio-economic characteristics: gross domestic product, unemployment rate, population density, stock market capitalization of companies and the intensity of goods movement. Using hierarchical clustering, we highlight the existence within the OECD of five relatively homogeneous groups of countries regarding the structure of taxation. The categories of taxes analysed are total collected revenues, personal income tax, corporate profit taxation, mandatory social contributions, property taxes and taxes on goods and services.

Key words: tax system, tax structure, correlations, hierarchical clustering, OECD countries

JEL classification: G17, G32, H25

1. INTRODUCTION AND LITERATURE REVIEW

Especially periods of economic recession are likely to create difficult situations in the national public finances of most states. There are two ways to alleviate these inconveniences, namely reducing public spending and increasing the collection of tax revenue. We address some ideas on possible fiscal transformations that can improve public finances compared to the current structure. Reformist ideas of this kind have their origins in some academic studies by Mankiw et al. (2009) and Diamond and Saez (2011). One can ask, for example, what path to take in terms of overcharging exceptionally high incomes. A major problem with taxation is the possible impoverishment of some segments of the population. The effect may be the removal of some people from the labor market (Jacobs, 2013). Some possible solutions adopted in some countries refer to direct credit systems at the employee's workplace, through tools such as income tax credit, to stimulate the presence of the individual in the labor market (OECD, 2011a).

A hypothesis unanimously accepted by theorists and practitioners is that the primary fiscal goal of government authorities is to increase social welfare. This includes both obvious components such as material well-being or health, as well as more subtle ones such as citizens' free time or the quality of the environment (Jacobs, 2013). The individual utility is given by the personal consumption of goods and services of the individual, including here even more subtle components than those already stated.

An economic analysis hypothesis in this context assumes that we are talking about efficient markets if we do not intervene at the level of the authorities. In the case of market failures, it is assumed that the government intervenes efficiently and in the right direction, for example through offers of public goods, thus leading to an increase in social welfare compared to the situation before the intervention. Of course, the interventions can refer to both the revenue and the expenditure side, but in this analysis, we refer only to the accumulation through tax mechanisms.

Another theoretical hypothesis assumes that the tax base is subject to taxation only if it has as a direct consequence the upgrading of social welfare. So, it is not the issues of public or social equity that should or should not provoke targeted collection on certain bases (Jacobs, 2013). Legal experts often have different views from economists on what taxes they have should be privileged or discouraged. There are also philosophical and psychological currents that appeal to the perceptions of certain physical contributors regarding fairness. It has been shown that any regulatory supplement coming from the legal sphere to appeal to certain fairness or fairness behaviors restricts the maximization of social utility and contradicts the Paretian optimum (Kaplow and Shavell, 2002). However, there are certain criteria that incorporate the hesitations of preferences at the individual level and still allow the observance of a certain specification of the paretian optimum (Bernheim and Rangel, 2009).

Capacities to accumulate income or capital probably vary over time, especially under the influence of investments made in human capital formation through educational processes or continuous training and specialization. Even if this variability is known, flat-rate mechanisms cannot be applied at the level of the individual person (Jacobs, 2013). Public authorities can only base their taxation on clear values and behaviors in terms of value, ie income from gainful activities, capital gains or movement of goods and consumption mechanisms. A good balance will have to be found between equity and efficiency, respectively between a social correctness of redistribution and the efficient stimulation of the productive capacities of individuals. Despite these considerations, when comparing tax alternatives, in practice, administration and collection costs will have to be considered, especially in the segment of capital taxation and movement of goods and services.

There are consistent debates in the economic literature about the optimal taxation of personal income, some contributions in this sector being recognized even by the Nobel Prize (see for example Mirrlees, 1971). There is a constant in these views, namely the idea that the optimal income taxation is not a linear function, no matter how social or liberal the government's policy on redistribution is (Barrios et al., 2020). The optimal taxation of earnings is achieved if the marginal gain has such a value that there is a value equivalence between the benefits achieved by the marginal distribution of the gain and the marginal cost of efficiency (Jacobs, 2013). Econometric estimates made in the last two decades show that marginal tax rates are in most cases U-shaped, whatever the values of social preferences in relation to redistribution (Zoutman et al., 2011). Although the optimal shape of the taxation function is not linear, its mathematical shape depends essentially on the statistical distribution of the ability to make gains. For gains higher than the modal one, the marginal rate of taxation is substantially influenced by the social-egalitarian policies regarding the redistribution of incomes between taxpayers (Stephenson, 2018). The maximum optimal marginal percentage related to the income tax is mathematically calculable if the Paretian optimum is considered (Atkinson et al., 2011). These calculations can consider the effects on earnings, the marginal social share, the elasticity of taxable earnings and the Paretian parameter of the statistical distribution of income (Saez, 2001). Consumption of goods and services can cause phenomena of rivalry or competition between consumers, and in these circumstances rather causes a supply of too much labor (Kanbur et al., 2006). Leisure can manifest itself as a good related to a social status (Alesina et al., 2005), and very high values of consumption of this good can have negligible negative effects on work ethic (Lindbeck and Nyberg, 2006). Such human behaviors therefore lead to deviations from the optimal taxation of earnings from work.

The initiation of economic and fiscal ideas on a flat tax on income was made by Friedman (1962). The problem remains topical, there are even more recent studies, based on national

economic simulations that support such taxation (Mankiw et al., 2009). Some practical applications and simulations have concluded that the total marginal tax burden is constant if income tax credits, tax deductions and subsidies are taken into account (Gielen et al., 2009). Consequently, even if a tax system is introduced which presupposes the existence of a single tax and any deductions, subsidies and tax credits are abolished, the actual marginal tax burden does not change significantly. Consequently, the total value of the economy related to the redistribution of earnings is not affected (Sarin et al., 2021). The most important advantage of a single flat-rate tax on earnings is the avoidance of taxable mass transfers between individuals, between various taxable masses and from one tax period to another, which are common practice under non-linear taxation (Rogers, 2019). The non-linearity or more precisely the progressiveness of taxation has the premises to offer significant incentives to achieve savings that can be used later, after retirement (Jacobs, 2013). This mechanism already exists in some countries, especially in the most developed ones (OECD, 2011c). Such transfers act on the principle of income insurance (Kleven et al., 2011), but can generate tax evasion of considerable amounts. Another aspect related to transfers in the case of taxes in non-linear (most often progressive) forms concerns changes in the ratio between quantities of labor and capital, respectively, in favor of the latter if it benefits from a lower tax rate (Fuest and Weichenrieder, 2002). A clear division between labor and capital gains must be established to minimize transfers through arbitration, as is the case, for example, in Norway (Sørensen, 2009).

The economic literature abounds in different opinions on the reasons, methods, and optimal level of taxation of capital income. There are serious currents of economic opinion that argue that capital gains should be exempt from taxation (Banks and Diamond, 2010, Diamond and Saez, 2011). Instead, there are theories that encourage the taxation of capital gains, based on arguments about efficiency and fairness. It is demonstrable that these taxes lead to an increase in the labor supply of individuals (globally speaking, we will work harder in an economy), reduce taxable mass transfers between categories (arbitration) and are an effective incentive for human capital development (Fisman, 2017). Also, this offer of lucrative benefits is reduced if individuals work a shorter daily time or leave the labor market, for example through early retirement (Jacobs, 2013). Thus, in general, the complementarity of consumption in relation to leisure increases at older ages. Econometric estimates using data from various national economies have shown that this phenomenon is the most widespread (Conesa et al., 2009), the authors also calculating the optimal level of taxation of capital gains in the cases studied. A case studied in more detail is that of the Finnish economy (Pirttilä and Suoniemi, 2010) which shows the strong inverse correlation between the total labor supply of individuals in society and the income from the exploitation of capital. The economic literature unanimously agrees that the decision to leave the labor market early is decisively influenced by financial motivations (Gruber and Wise, 2002). The taxation of capital gains negatively affects the possible income to be obtained after retirement, so it stimulates a longer stay in the labor market (Jacobs, 2009).

Taxes on real estate, especially those with housing status, are very low in many developed countries in northern and western Europe and even on the North American continent (OECD, 2011b). In addition, there are large facilities for the purchase of housing, the rates related to real estate bank loans are deductible from the income tax of individuals. Moreover, in many cases the taxation of rents is modest or even zero (Andrews et al., 2011). In support of the desire of individuals to buy real estate, tax incentives are provided to partially cover the purchase financing, especially if interest due to credit institutions benefit from tax deductibles, or rent is subject to tax or even exempt (Wyatt, 2019 and Carrillo, Castro, & Scartascini, 2021). Such mechanisms, which generally lead to positive contributions to economic growth, are very harmful in the case of economic crises due to leverage (Jacobs, 2013). In the wake of the financial and economic crisis of a decade ago, the overall value of real estate debt related to housing loans ranged from 82% to 103% of GDP in some Western European countries and the USA (IMF, 2011). There are still some policies in certain national systems that significantly tax the real estate transaction. Even if they are very easy to collect, such taxes introduce economic disturbances in the functioning of markets,

seriously diminishing the mobility of the labor supply of individuals and the mobility of the housing asset market (van Ewijk et al., 2007).

Studies on the optimality of tax systems have raised the issue of the role of indirect taxes given that public authorities already have at hand the other tax instruments usable for redistributive purposes: taxation of income of any kind, tax transfers and tax credits, subsidies, etc. Synthesizing a very abundant academic literature, one can identify (Jacobs, 2013) key arguments for public authorities to impose indirect taxation. The first argument considered is that the fiscal focus on the trading of goods and services can be useful if it causes an increase in the overall labor supply of individuals in a society. Economic logic requires that the greater the complementarity of a good or service in relation to the free time of individuals, the higher the tax rate must be (Jacobs, 2013). A study of goods markets in England (Crawford et al., 2010) indicates a rather high level of complementarity in relation to leisure for food (especially those in strict need), energy products, cigarettes and public transport. High level of complementarity with work effort is noted for alcohol, personal transport fuels and services in bars and restaurants. For the countries of northern Europe, Pirttilä and Suoniemi (2010) identify for the first category the incomes from the exploitation of the accumulated capitals and the expenses related to the dwellings, and for the second category the consumptions realized for the purpose of caring for minor children. The second theoretical argument in favor of indirect taxation is their possible contribution to the social redistribution scheme. There are some considerations, especially stated in the political sphere that support direct taxation with the justification of an increase in equity (Jacobs, 2013). In some national economies, if there is an abundance of resources, especially natural ones, the amounts of one resource at a time can be redistributed through subsidies applied to goods, tax credits in relation to actual revenues, or non-value provisions.

If consumer preferences over certain classes of goods and services have positive associations with the ability to generate income, the demand for products has the character of an information provider regarding the identification of individuals with lower or higher earning capacity, so indirect taxes would be a useful solution for redistributive purposes (Saez, 2002). In econometric estimates on national markets, Gordon and Kopczuk (2010) show that capital gains are positively associated with individual ability to earn income from labor. Distributive superiorities in the case of high indirect taxes on luxury goods and low indirect taxes on essential goods have not yet been highlighted in the applied studies. The definitions are too global and heterogeneous within each category to be able to hope for clearly increased distributional contributions. Crawford et al. (2010) identified for the English markets that higher redistributive values cannot be achieved through differentiations in the indirect tax regime, as they can be equally well achieved through the personal income tax. Instead, they can have negative effects by distorting the structure of production, distorting the fairness of competitive processes, and creating imbalances or trade distortions (Cnossen, 2010) and as a result differentiated indirect taxation should be abandoned.

The level of tax burden determines a certain level of collected tax revenues at the budget which go back toward the population under the form of various benefits and thus, it is a main drive for creating welfare. Opposite, beyond a threshold of perceiving these taxes as a burden, the level of tax avoidance and also the level of shadow economy may increase. Thus, most of the specialized literature (Achim and Borlea, 2020, p.96; Achim et al. 2021; Devereux and De Mooij 2009; Mara 2010; Schneider and Klinglmair 2004;Torgler and Schneider 2009) works which dealt with the analysis of the taxation system effects on the corporate behaviour reveal that the shadow economic activities are enhanced as the real and perceived tax pressure increases.

The theoretical considerations presented are of a general nature, being discussed arguments related to economic mechanisms. The reality of each country is much more complex. Beyond the economic arguments, there are also traditional, social, cultural aspects, etc., which determine both the degree of taxation of the economy and the differences in the weight of the different taxation components. Countries act more or less liberally versus socially in terms of the size and structure of taxes. These modes of action are perpetuated in the long run, even if political parties with different orientations succeed each other in government.

In order to be able to analyze the differences that exist from one country to another, we carry out an empirical assessment of OECD Member States. It analyzes both the general level of taxation and the main categories of taxes. The possible correlations of each category are analyzed in relation to some macroeconomic aggregates: the level and rate of GDP growth, the stock market capitalization of companies, the unemployment rate, the population density, and the intensity of goods circulation. We also make a ranking of the countries, both in terms of total tax revenues and its components. Through hierarchical clustering we identify and comment on the main behavioral patterns of OECD countries in terms of taxation.

2. OBJECTIVES, METHODOLOGY AND VARIABLES

Our study has the following two main objectives:

- Using as a theoretical basis the cited academic literature and using the example of OECD countries, we highlight some correlations between tax categories and some aggregate economic indicators.
- We identify through hierarchical clustering and analyze quantitatively and qualitatively some national behavioral patterns regarding the main categories of taxes.

To achieve the first objective, we select based on the academic literature the main economic indicators likely to be correlated with the taxation categories. Of course, the number of these indicators is very high. For the results to be as robust as possible, the presentation will contain only those correlations that meet two conditions: (1) economic theory largely agrees; and (2) the empirical evidence from OECD countries confirms the theoretical assumptions.

To achieve the second objective, we use hierarchical clustering using the Euclidean distance between the centroids of the groups (Ward linkage). First, to give them the same weight in the analysis, the variables are standardized. For each, subtract the mean and divide by the standard deviation. The standard normal distribution is then applied. Thus, values between 0 and 100 are obtained, in which the highest value corresponds to the maximum value in the sample for a certain taxation category. As a measure of the proximity between countries and between groups, the Euclidean distance is used:

$$D(K_A, K_B) = \sqrt{\sum_{i=1}^{5}(X_{iA} - X_{iB})^2} \qquad (1)$$

Where K_A and K_B are any two countries (or groups of countries), and X_{iA} represents the value for tax category i related to country (or group) K_A. Using this distance, the countries are grouped on the hierarchical principle, initially forming groups that contain the closest neighbors statistically, from the point of view of the variables used. After the formation of the first groups, with very similar elements between them, the distances between groups are calculated. For three individual elements or clusters K_A, K_B and K_C the distances are calculated as follows:

$$D(K_A \cup K_B, K_C) = \frac{N_A+N_C}{N_A+N_B+N_C} D(K_A, K_C) + \frac{N_B+N_C}{N_A+N_B+N_C} D(K_B, K_C) - \frac{N_A+N_B}{N_A+N_B+N_C} D(K_A, K_B) \quad (2)$$

where N_A, N_B and N_C represent the number of elements in the clusters K_A, K_B and K_C.

The algorithm is continued until all the elements are reunited in a single group. The final division of the groups is made so that inside them the variance is minimal, and between them the variance is maximum.

Variables

TAX_REVENUE

Tax revenue is defined as the revenues collected from taxes on income and profits, social security contributions, taxes levied on goods and services, payroll taxes, taxes on the ownership and transfer of property, and other taxes. Source: OECD (2020).

TAX_PERS_INCOME

Tax on personal income is defined as the taxes levied on the net income (gross income minus allowable tax reliefs) and capital gains of individuals. Source: OECD (2020).

TAX_CORPORATE

Tax on corporate profits is defined as taxes levied on the net profits (gross income minus allowable tax reliefs) of enterprises. It also covers taxes levied on the capital gains of enterprises. Source: OECD (2020).

SOCIAL_SECURITY

Social security contributions (percentage of GDP) are compulsory payments paid to general government that confer entitlement to receive a future social benefit (unemployment insurance benefits, accident, injury and sickness benefits, old-age, disability and survivors' pensions, family allowances, etc. Source: OECD (2020).

TAX_PROPERTY

Tax on property (percentage of GDP) is defined as recurrent and non-recurrent taxes on the use, ownership, or transfer of property. Source: OECD (2020).

TAX_GOODS

Tax on goods and services (percentage of GDP) is defined as all taxes levied on the production, extraction, sale, transfer, leasing or delivery of goods, and the rendering of services, or on the use of goods or permission to use goods or to perform activities. They consist mainly of value added and sales taxes. Source: OECD (2020).

GDP_CAP

GDP per capita (US $) is gross domestic product divided by midyear population. Source: World Bank (2020).

MKT_CAPITAL

Market capitalization of listed domestic companies (% of GDP) is the share price times the number of shares outstanding for listed domestic companies. Source: World Bank (2020).

UNEMPLOYMENT

Unemployment, total (% of total labor force) refers to the share of the labor force that is without work but available for and seeking employment. Source: World Bank (2020).

POP_DENSITY

Population density (people per sq. km of land area) is midyear population divided by land area in square kilometers. Source: World Bank (2020).

EXP_GDP

Exports of goods and services (% of GDP) represent the value of all goods and other market services provided to the rest of the world. Source: World Bank (2020).

For all variables, the values taken into account in our analysis refer to the averages of the period 2000 - 2019.

3. RESULTS AND DISCUSSION

In order to achieve the proposed research objectives, we are researching the fiscal situation in OECD countries. The choice is not accidental, these countries have a unitary way of reporting the

collection of budget revenues and defining the categories of taxes. Thus, comparisons can be made both between countries and between different tax categories.

The list of the 37 countries in the sample includes the states of the OECD: Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Chile (CHL), Columbia (COL), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Ireland (IRL), Israel (ISR), Iceland (ISL), Italy (ITA), Japan (JPN), South Korea (KOR), Lithuania (LTU), Latvia (LVA), Luxembourg (LUX), Mexico (MEX), Netherlands (NLD), Norway (NOR), New Zealand (NZL), Poland (POL), Portugal (POR), Slovakia (SVK), Slovenia (SVN), Sweden (SWE), Spain (ESP), Switzerland (CHE), Turkey (TUR), United States of America (USA) and United Kingdom (GBR).

Table no. 1. Descriptive statistics of variables

Variable	Min.	Max.	Median	Mean	St. dev.
TAX_REVENUE	13.4	45.9	32.5	32.96	7.47
TAX_PERS_INCOME	1.04	24.42	7.05	7.92	4.34
TAX_CORPORATE	1.51	8.53	2.83	3	1.34
SOCIAL_SECURITY	0	16.07	10.46	8.65	4.72
TAX_PROPERTY	0.28	3.91	1.72	1.78	1.05
TAX_GOODS	4.36	15.69	11.26	10.74	2.65
GDP_CAP	5229	94439	32259	33545	20218
MKT_CAPITAL	4.7	214	55.2	65.4	44.1
UNEMPLOYMENT	3.58	15.87	6.93	7.65	3.15
POP_DENSITY	2.9	509.4	101	132.4	131.3
EXP_GDP	11.5	99.7	40.8	44.3	20.7

Source: authors' calculations using data from OECD and World Bank.

The correlation of revenue taxation with economic development. Economic theories suggest different correlations of taxation with macroeconomic aggregates. However, they suffer from certain corrections due to national specificities. Therefore, it remains to be seen whether the increase in the redistributiveness of taxation in relation to the level of economic development is confirmed. For this purpose, we considered the variables TAX_REVENUE and GDP_CAP (Figure 1). We note first a positive, but non-linear correlation of the total taxation in relation to the GDP per capita. Classic examples in this regard are Norway, with a taxation of 40.9% of GDP and an average GDP per capita of the period of 74934 USD, and at the opposite pole Mexico, with 13.4% and 9026 USD respectively. Examples that do not fit into this mechanism are few and far between. For example, Switzerland taxes moderately (27.2%) for a very high GDP of USD 70456. A contrary example would be Hungary, which has a high taxation (37.9%) for a relatively modest GDP of 12126 USD. The general trend, given by the identified positive correlation, is explained by the fact that a developed country has high values of all tax bases, so it can afford high levels of taxation, without significantly affecting the standard of living of citizens.

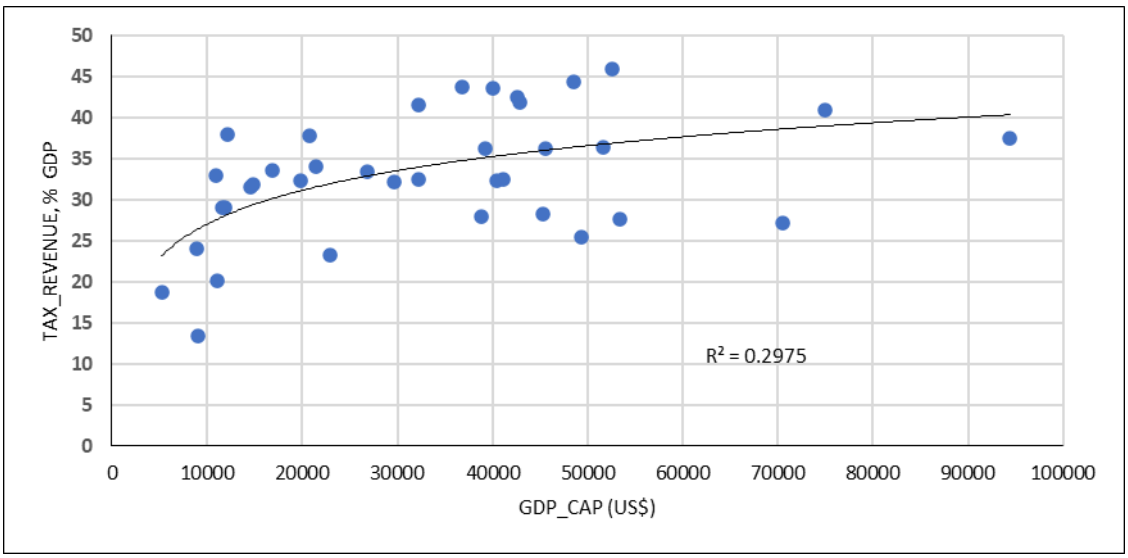

Figure no. 1. Correlation between GDP_CAP and TAX_REVENUE
Source: authors' calculations using data from OECD and World Bank

The correlation of personal income taxation with economic development. Taxation of personal income is in theory related to the possibility of contribution. For countries where the wage level is high, income tax does not create problems for citizens to pay, because basic needs are covered anyway. At the level of the studied sample, consistent data are not available for all countries and periods regarding the national average salary. Instead, it is generally highly correlated with GDP per capita. For this purpose, for OECD countries we considered the variables TAX_PERS_INC and GDP_CAP (Figure 2). The analysis shows a fairly strong positive correlation between GDP per capita and income taxation. We can exemplify through Norway, with a GDP of 74934 USD / inhabitant and an income taxation with 9.95% of GDP, compared to Colombia with a GDP of 5229 USD / inhabitant and a personal taxation of 1.04% of GDP. Deviations from this mechanism are found in Luxembourg (94439 USD and 7.9%), or another example that deviates from the general trend, namely Denmark which has an excessive taxation of 24.42%. This correlation between the two variables is the strongest we identify between a macroeconomic aggregate and a tax component.

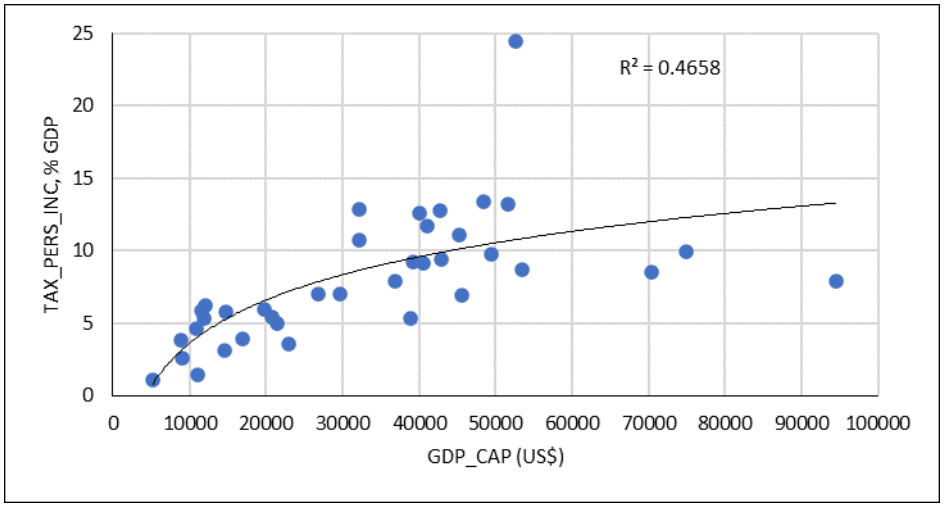

Figure no. 2. Correlation between GDP_CAP and TAX_PERS_INCOME
Source: authors' calculations using data from OECD and World Bank

Correlations of corporate taxation with economic and stock market development. Taxation of companies is essentially related to their ability to pay. In general, economic development is associated with companies in good financial condition, which is therefore an attractive taxable mass. It is also easier to control the collection process if there are larger companies than a multitude of small businesses. There are no available data on the size structure of companies in all national territories in international sources. A proxy variable that could measure this situation is the market capitalization, (MKT_CAPITAL). The correlation between economic development and corporate tax values is a direct one, quite consistent, but non-linear (Figure 3). Suitable examples would be Turkey (GDP / capita of 8861 USD and a tax of 1.71% of GDP), and at upper end Luxembourg (GDP / capita of 94439 USD and a tax of 5.61% of GDP). Very high taxation is made by Norway (8.53% of GDP), even if it achieves a lower GDP per capita than Luxembourg. In this general framework, there are also atypical behaviors, such as the case of Colombia, which at low values of economic development (GDP / capita of 5229 USD) tax companies quite heavily (4.29% of GDP), relaxing taxation from other sources. Although there are theoretical arguments in this regard, the data show a very weak correlation between market capitalization and corporate taxation (Figure 4). This result has some possible explanations. First, there may not be a privilege of taxing companies if large corporations develop on the national territory, the emphasis on taxation going balanced and on small businesses. Secondly, the indicator used could be a bit misleading. In some countries the market is dominated by foreign companies, a good source of taxation, but they are not found in the national market capitalization.

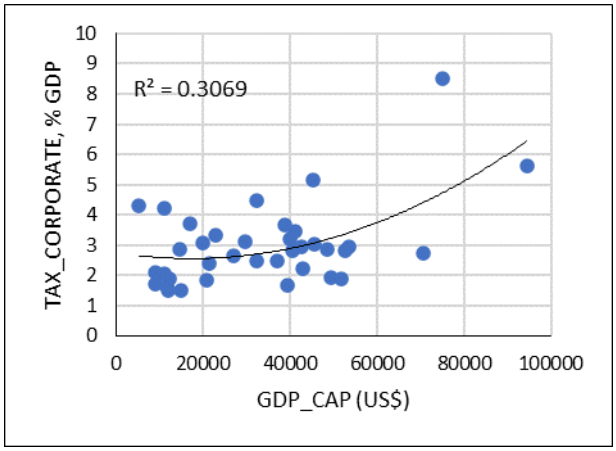

Figure no. 3. Correlation between GDP_CAP and TAX_CORPORATE

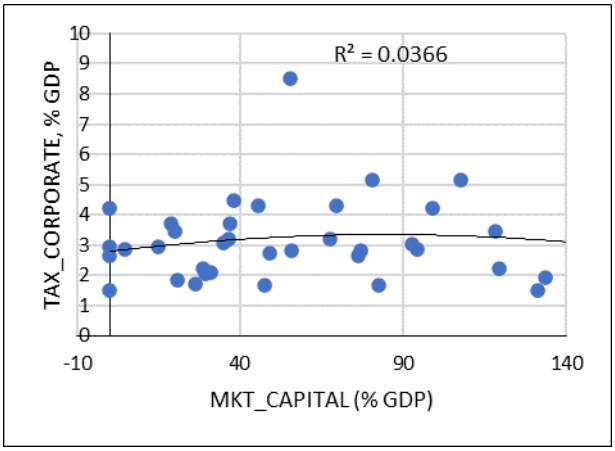

Figure no. 4. Correlation between MKT_CAPITAL and TAX_CORPORATE

Source: authors' calculations using data from OECD and World Bank

Correlations of social security contributions with unemployment. Of course, these correlations must be placed in the context of liberal national policies on income redistribution. These policies, sometimes long-term, for decades, also influence the way of financing some social needs, respectively very different proportions of their coverage from public versus private sources. For example, some economies work better with high unemployment values, relying heavily on encouraging competitiveness. Others, on the contrary, reduce unemployment as much as possible, for a more massive participation of citizens in the labor market. Similar mechanisms can be considered in the healthcare market. These behaviors are expected to influence the contribution to compulsory social security. One can notice (Figure 5) a low linear correlation between social contributions and unemployment rate. The result is in line with economic theory, countries that allow higher unemployment to increase competition in the labor market must cover public funding benefits. Classic examples of this positive association are South Korea (5.37% unemployment contributions of 3.58%) and Greece (15.59% unemployment contributions of 15.59%), respectively.

Of course, there are also atypical situations, such as the one in the Netherlands, where large social contributions (13.45%) are perceived for low unemployment (4.7%). Of course, this analysis is also disturbed by the fact that unemployment is not the only social destination, but we started from the premise that the various social destinations have about the same degree of coverage in a country.

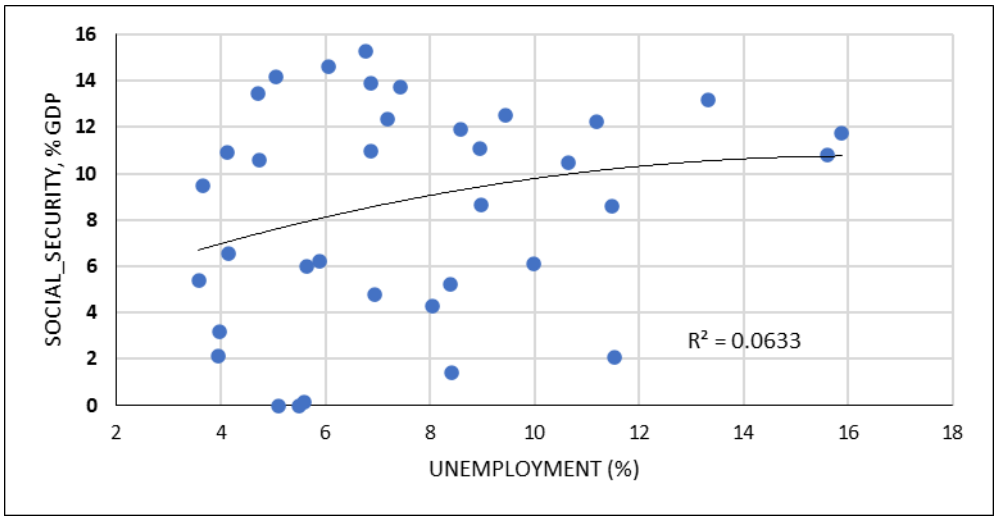

Figure no. 5. Correlation between UNEMPLOYMENT and SOCIAL_SECURITY
Source: authors' calculations using data from OECD and World Bank

Correlations of property taxation with economic development and population density. Although there are no very consistent economic theories in this regard, it is intuitively expected that property taxation will be positively associated with economic development. The explanation is based on the consistent value of properties in developed countries, which can be serious tax bases. As we have shown in the theoretical considerations in this chapter, the value of houses includes the premium of scarce (exhaustible) resource of the buildable land. We expect an interesting variable to be studied to be the population density, as a proxy for the difficulty of covering housing needs through new housing. The distribution of the countries in Figure 6 confirms the existence of a positive correlation between economic development and property taxation. Illustrative is the opposite position of Turkey (GDP of 8861 USD per capita and property taxation 0.93% of GDP) and Luxembourg respectively (GDP of 94439 USD per capita and property taxation 3.16% of GDP). On the other hand, very different values of property taxation in Austria (0.55% of GDP) and the United Kingdom (3.91% of GDP) are found as a counterexample for similar development levels (GDP per capita of USD 4288 and 40497 respectively. USD). In the same sense we can mention Colombia and Ireland, with very close levels of taxation (1.72% and 1.76%) but with major development differences (5229 USD compared to 53383 USD). The discrepancies reported in the association between economic development and property taxation are due to other influencing factors. Figure 7 shows a positive linear correlation of taxation in relation to population density. Israel, with a density of 351 inhabitants per km2 has a property tax rate of 3.14% of GDP, and Estonia, with a density of 31.4 inhabitants per km2 has 0.29%. Some exceptions to this rule can be explained by other factors: Canada, at a very low density of 3.8 places / km2 has a tax of 3.69%. This is since although the area is very large, the actual habitable territory is much smaller due to the unfriendly climate. Similar cases are those of Australia and Iceland.

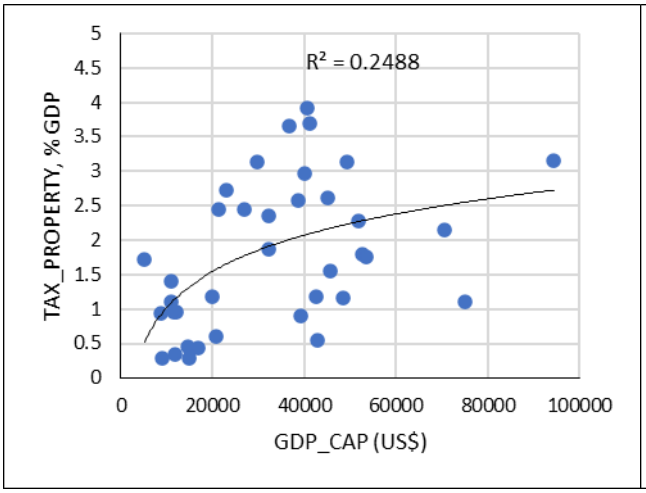

Figure no. 6. Correlation between GDP_CAP and TAX_PROPERTY

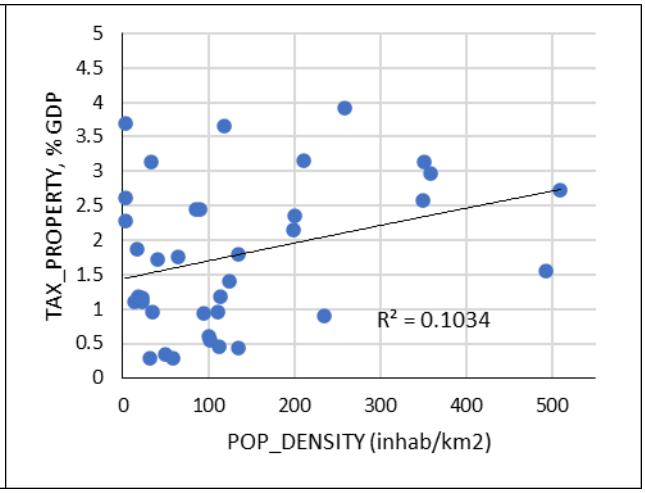

Figure no. 7. Correlation between POP_DENSITY and TAX_PROPERTY

Source: authors' calculations using data from OECD and World Bank

The correlation between the taxation of goods and the trading of goods. Taxation of goods and services (indirect taxation, most of which is VAT) has no theoretical economic links with economic development. More interesting would be to look at the associations between the level of these charges and the movement of goods in an economy. Of course, the latter concept is quite vague and does not have a precise unit of measurement. As an approximate measure, however, we will evaluate trade between states in terms of exports. As shown in **Figure 8**, the correlation is positive, but nonlinear. The comparison between Hungary (exports 76.3% of GDP and taxation of goods 15.69% of GDP) and the United States of America (exports 11.5% of GDP and taxation of goods 4.36% of GDP) is suggestive. There are also some countries that behave atypically, such as Switzerland, with high export values (59.9% of GDP) and low values of goods taxation (6.04% of GDP). Or the opposite, such as Greece, with low export values (59.9% of GDP) and high values of goods taxation (12.92% of GDP). Of course, as we anticipated earlier, this analysis has its limits. Exports do not say everything about the intensity of the movement of goods. For example, the United States, even though it has relatively low foreign trade values, has very intense domestic trade.

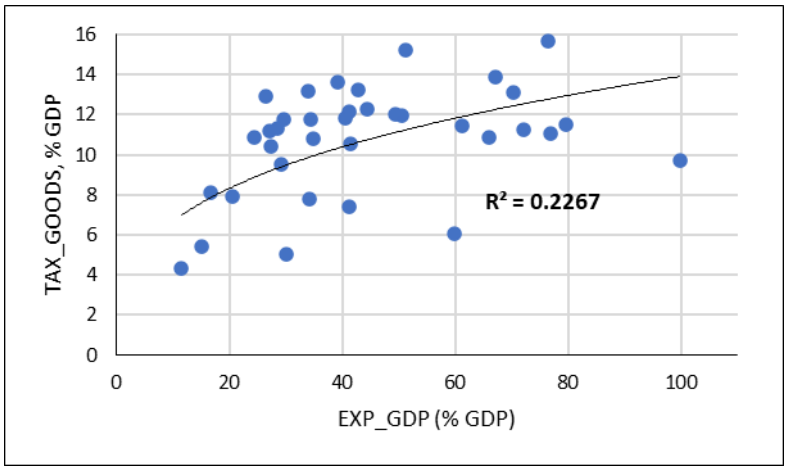

Figure no. 8. Correlation between EXP_GDP and TAX_GOODS

Source: authors' calculations using data from OECD and World Bank

Clustering OECD countries in relation to the tax structure. Previous analyzes show some possible correlations of tax components with different macroeconomic aggregates. The issue

is instead more complicated since those components are not independent of each other but linked by phenomena of complementarity and substitutability. To address these issues, we analyzed a cluster analysis, which allows the classification of countries using several variables simultaneously. The variables used in clustering are the five categories of taxes. Since their order of magnitude is not the same, we standardized the components by rescaling, bringing them to possible values between 0 and 100. Hierarchical clustering was then applied, using the Euclidean distance between the centroids of the groups (Ward linkage). Thus, five groups were obtained (Figure 9, Figure 10, Table 2, and Table 3) so that the variance on all variables is minimal in groups and maximum between them.

Table no. 2. Composition of clustering groups

group 1	Australia (AUS), Canada (CAN), Switzerland (CHE), United Kingdom (GBR), Ireland (IRL), Israel (ISR), Japan (JPN), South Korea (KOR), Luxembourg (LUX), United States of America (USA)
group 2	Belgium (BEL), Spain (ESP), France (FRA), Italy (ITA)
group 3	Denmark (DNK), Iceland (ISL), Norway (NOR), New Zealand (NZL)
group 4	Chile (CHL), Columbia (COL), Mexico (MEX)
group 5	Austria (AUT), Czech Republic (CZE), Germany (DEU), Estonia (EST), Finland (FIN), Greece (GRC), Hungary (HUN), Lithuania (LTU), Latvia (LVA), Netherlands (NLD), Poland (POL), Portugal (POR), Slovakia (SVK), Slovenia (SVN), Sweden (SWE), Turkey (TUR)

Source: Authors' calculations

In group 1 is found the most balanced taxation in terms of components studied. The average values in the group are quite close to the OECD average. However, we can see lower than average percentages in social spending and higher in property taxation. This group has a high average GDP per capita (USD 48592) and the highest average density (198 inhabitants / km2). The second group, which includes only European countries, has as its main feature the very high average value of social contributions (13.5% of GDP) and high values of income taxation (9.6% of GDP), the rest of the components being in around OECD environments. The average unemployment values are the highest (10.43%). And the population density is very high (average of 191 inhabitants / km2), although property taxes do not have very high values. In the third group are predominantly northern European countries. They act atypically from a fiscal point of view, with very high values of taxation of incomes, corporations and goods, very low values of social contributions and average taxation of properties. From the point of view of economic development, there are countries with a very high average level of GDP (USD 52,875 per capita). Population densities are also low, with an average group of 41.75 inhabitants per km2. In group 4 we find exclusively Latin American countries. The main feature is the low total taxation. Almost all categories of taxation have much lower rates than the OECD average (eg 1.7% of GDP income taxation and 1.9% social contributions). The fiscal interest is disproportionately directed towards a single component, the taxation of companies having an average value of 3.5% of GDP, above the OECD average. Regarding the macroeconomic aggregates considered, this group has the lowest average values of GDP per capita (USD 8416), population density (40.53 inhabitants per km2) and exports (27.3% of GDP). The fifth group is geographically heterogeneous, but here are all the countries of Eastern Europe and most of those of Central Europe. We notice higher values of taxation of goods and services (12.3% of GDP) and social contributions (11.7% of GDP). This is largely explained by higher values of unemployment (8.89%) and the movement of goods (exports 52.71% of GDP). For the other three components, the group averages are slightly lower than the OECD averages.

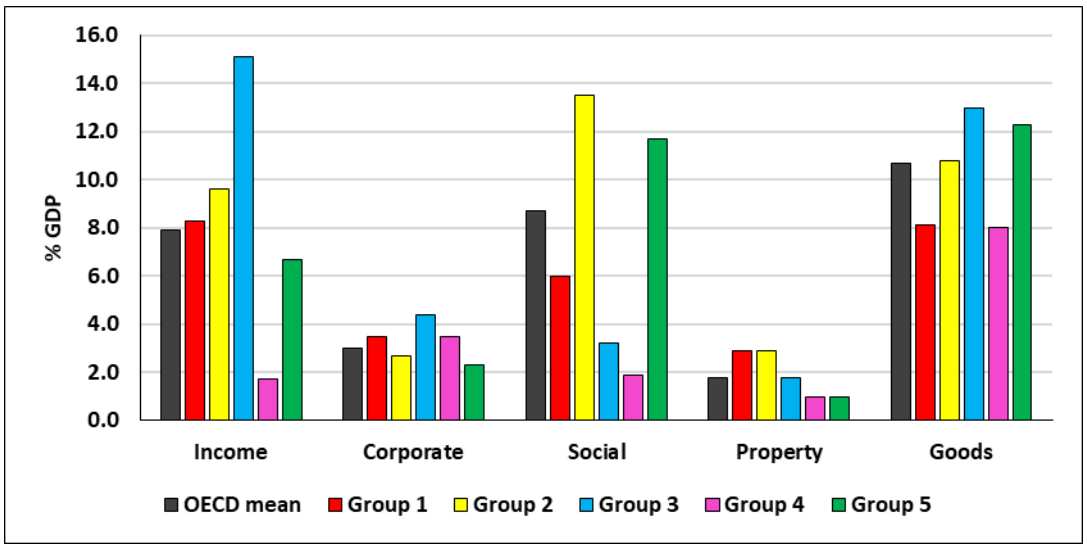

Figure no. 9. Comparison of the average values of the tax categories
Source: authors' calculations using data from OECD and World Bank

Table no. 3. Comparison of the average values from the groups resulting from clustering

	OECD mean	group 1	group 2	group 3	group 4	group 5
TAX_REVENUE	*7.9*	8.3	9.6	15.1	1.7	6.7
TAX_PERS_INCOME	*3.0*	3.5	2.7	4.4	3.5	2.3
SOCIAL_SECURITY	*8.7*	6.0	13.5	3.2	1.9	11.7
TAX_PROPERTY	*1.8*	2.9	2.9	1.8	1.0	1.0
TAX_GOODS	*10.7*	8.1	10.8	13.0	8.0	12.3

Source: Authors' calculations

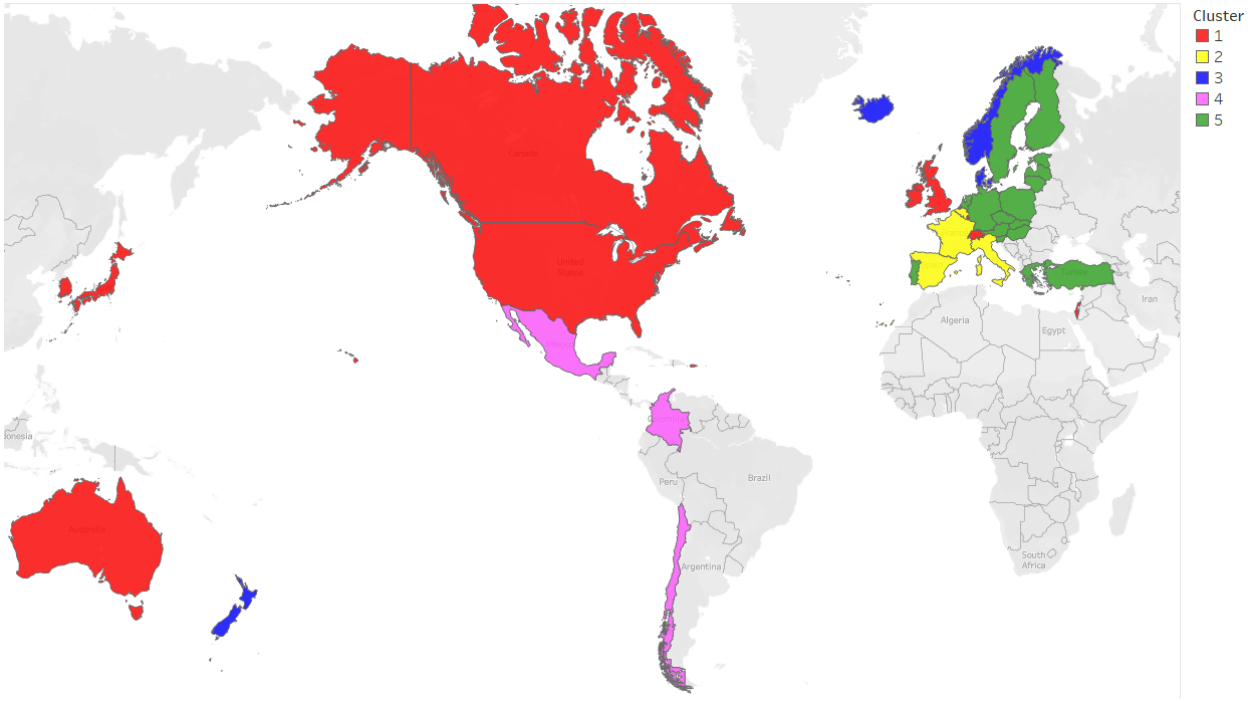

Figure no. 10. Geographical distribution of groups resulting from hierarchical clustering (authors' calculations in Tableau)

4. CONCLUSIONS

We first addressed aspects of economic theory, especially those related to optimal taxation. Recommendations on fiscal policy can be deduced from the theoretical analysis. They are based on the desire to achieve the highest possible values of social welfare. Of course, these recommendations and policies are not fixed or rigid, because they depend on more or less liberal and social policies on the redistribution of welfare.

If we refer to the taxation of personal income from lucrative activities, it is unanimously appreciated by economists that they should not be linear, in a single quota. We discussed that regardless of government preferences for redistribution, such taxation is not economically optimal. The linear tax is attractive only by its apparent simplicity, but it cannot bring on the labor market more places in relation to a progressive taxation, at the same levels of redistribution of welfare. I also argued that economic optimality is achieved if there are separate taxation on gains from gainful activities and from the exploitation of capital, respectively. For reasons of unbalanced redistribution of wealth, a flat tax on all income is not desirable. The main reason for separate taxation of capital exploitation is to reduce the imbalances generated by the progressive, non-linear taxation of labor income. Taxes on the exploitation of capital manage to increase the global labor supply, provide incentives to stay active for a longer time, increase interest in investing in education and training and reduce the taxation of taxable masses between labor and capital. With regard to property taxes, in the case of real estate inhabited by those who own them, they must be taxed similarly to other assets. Instead, the expenses generated by the purchase of real estate assets, in particular mortgage rates, must be deducted from taxes on capital gains. As a result, the rents charged by the owners are optimal to be equivalent in value to the average returns of real estate assets. The analysis of the economic theory shows that the similar taxation of the circulation of all goods and services in the same quota is not optimal. However, it is at least doubtful that differentiated taxation of goods would bring greater benefits than the additional costs generated by the more difficult management of such differentiations.

We also conducted an empirical analysis of total and income taxation in OECD countries. There was a great heterogeneity of fiscal policies, both in terms of volume and structure. Total taxation differs by almost 30% of GDP between the most taxed economy and the least taxed. Hierarchies are not similar in relation to tax categories. Countries that are in a higher position in terms of some sources of taxation are at the bottom of the ranking compared to others. We have noticed here possible phenomena of substitutability or complementarity between the sources of budgetary financing. However, there are also countries that tax all sources relatively homogeneously, either at low or medium levels.

The empirical analysis of the correlations between each tax category and some macroeconomic aggregates highlighted several associations, present in the economic literature. Economic development, measured by GDP per capita is positively correlated with total taxation and some categories. The result can be explained by the fact that richer countries have less reluctance to tax the population, as it generally has no ability to pay, with basic needs being provided for almost all citizens. No correlations of global taxation or of the categories with the growth rate of GDP were noticed in the studied two-dimensional relations. The taxation of the population's income is positively correlated with the economic development, the explanation being given previously. A similar result was obtained for taxing companies. Instead, we could not highlight the relationship with market capitalization. This result may not be very conclusive, as the variable used, namely the market capitalization of domestic companies, does not fully measure the phenomenon, in some countries, especially emerging ones, much of the production market is controlled by foreign companies. However, I noticed associations of social contributions with the unemployment rate. Countries that, although developed, operate with a high level of unemployment to encourage competitiveness in the labor market are required to cover the related social needs through dedicated contributions. Population density is positively correlated with property taxation, countries with lower buildable land are required to include in the level of the tax and the cost of scarce resources.

The taxation of goods and services, most of which is covered by VAT, is positively correlated with the movement of goods, including the share of exports in GDP, the explanation being given by the abundance of the taxable mass.

The cluster analysis of the structure of national taxes identified five behavioral patterns. These are not necessarily hierarchical, but largely complementary. There are countries that tax companies more aggressively and the income of the population more relaxed. The identified groups also have some geographical distribution. For example, all OECD countries in Latin America are in the same cluster, as are those in Eastern Europe. In contrast, developed European states do not have a common fiscal pattern, despite the homogeneity of economic development, their behavior seems to be largely dictated by historical customs and economic policies inclined to social redistribution.

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