Fiscal, Economic, Health and Cultural Indicators Connected with the Development of Sport

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Abstract
In the last century, sport has gradually shifted from a leisure activity to an economic sector. The implications are numerous, the relations with the economic and social life have developed enormously. The commercial relations that appeared around the sports activities led to the consolidation of some financial flows in relation to the sports equipment manufacturers, the governmental authorities, the written and audio-visual press. Our study assesses the relationship between the level of development of sport at national level and several economic, fiscal, cultural, and public health indicators for European countries. The data required for the estimates are collected from international institutions such as Eurostat, World Bank, World Health Organization, Global Association of International Sports Federations, and national sports institutions from the sampled countries. Bivariate analysis shows more or less strong correlations with the socio-economic indicators considered. However, these results can be altered by possible situations of multicollinearity that can cause confusion. In the multivariate analysis, hierarchical clustering indicates five behavioural types of countries in terms of the relationship between public and professional sport with macroeconomic aggregates.
Keywords: Public Sport, Elite Sport, Economic Development, Fiscality, Public Health, Clustering, European Countries

Introduction and Literature Review
Sport is a physical and recreational activity that is practiced very differently from one country to another. It differs significantly first the intensity of the practice, respectively the proportion of the individuals in the society involved in this activity, but also the average duration that a practitioner allocates. Secondly, the favourite sports are not the same. Thirdly, the

relationship between table sports and high performance is very heterogeneous. At the same time, within a country the practice of sport can be very different depending on the region, sex, race, socio-economic condition or even traditions (Szczepaniak, 2020). There are studies in the literature that investigate the participation of individuals in a society (Berger et al., 2008). Some research focuses on specific determinants of a particular sport (Breuer et al., 2011).

If these variations from one individual to another are explained in the literature, the concerns to explain the heterogeneities between countries are less. First, this is due to the complexity of the phenomenon. Very diverse social and economic indicators must be considered, related to economic development, financing, population health, international sports performance, cultural aspects, and aggregate national behaviour. Also, the correlations between these factors are very intense, often posing serious methodological problems. But we will try to shed some light on these phenomena, comparatively evaluating certain behavioural patterns of nations.

Determinants of Practicing Sports at the Micro Level
To be able to provide a clearer picture of the connections of sport with other sides of society at the international level, it is useful to explain what is happening at the individual level. What determines a person to practice sports or to be competitive in this field. Of course, to shed light on these issues, we should focus a little on defining some notions, at least those related to participation and performance.

In the literature there are several concerns to establish what is the participation in sports activities, just to be able to make comparisons between studies. Different definitions would only complicate the situation. However, opinions differ, with some authors preferring to evaluate the activities carried out in the last month (Humphreys and Ruseski, 2009), but there are also preferences to evaluate the activities carried out over a shorter period of 14 or 7 days (Leslie et al., 2004). Of course, there are opinions that set other time intervals, longer or shorter. But there is also a wide issue to be clarified. Some authors define participation according to its duration, ie at least half an hour, an hour, or a certain number of hours (Stoldt, 2020). Other researchers, on the other hand, are more concerned with frequency, that is, the number of participants in activities, whether they consider the time allotted.

Other important definitions are aimed at establishing what may or may not be considered a sporting activity (Breuer et al., 2011). Some studies focus on more limited activities such as range and variety, including only established sports, such as those recognized at the Olympic level, or those with national federations. Some researchers are more permissive, considering more activities as having a sporting character, including dancing, garden work for relaxation, walks in nature on joss have means of locomotive with human propulsion (Guarino, 2015). To have international comparability, the idea of considering only the first 5, 10 or 20 sports practiced in one country, but obviously others from one nation to another, is also circulated.

Speaking at the individual level, studies on participation in sports and consider very different explanatory variables. As in any study with the individual as a statistical unit, the most easily observed are the classic socio-demographic factors: sex, age, income, socio-professional status, level of education, race, migrant status, area of residence (Phar et al., 2020; Gracia-

Marco et al., 2010). The behavioural variables of people appear much less in applications, ie who they are as individuals. We refer here to cultural, emotional characteristics or favourite activities, other than those in the field of sports.

In terms of classical socio-demographic indicators, the distribution by sex is the most studied. If we look globally at all sports activities, men have a more intense and frequent participation than women (Humphreys and Ruseski, 2007; Robertson and Emerson, 2010). This phenomenon is also found at the national aggregate level (Downward et al., 2014). However, for some categories of sports, in some highly developed northern European countries the participation of women is higher than that of men (Eurostat, 2021).

Even more consistent are the opinions and results that refer to the evolution in relation to age (Humphreys and Ruseski, 2009; Van Tuyckom and Scheerder, 2010). However, a closer look shows that the applied methodology can produce misleading effects. It could be generation, not actual age (Halforty & Radder, 2015). In order to be able to isolate technically and methodologically speaking the age, cross-sectional data should be increased, ie the involvement of the same people in sports for a longer period of time. Of course, these studies are much rarer due to the difficulty of carrying them out (Breuer and Wicker, 2009). In addition to this aspect related to age versus generation, the situation should be analyzed multivariate, for example, the participation rate over time may evolve differently depending on gender or other variables such as socio-economic status.

A more unique variable is related to the emigration status of the person. Migrants have the role of bringing social behaviors from their places of origin, including some related to the practice of sports activities. For example, many Asian Americans practice sports characteristic of their home countries, such as contact sports (martial arts), table tennis, or badminton (Maguire, 2013). Nationality or race are involved in specialized studies, even if they no longer target migrants but people who have become citizens of the country of designation, sometimes for two or three generations (Snape and Binks, 2008; Jansen et al., 2018). In general, empirical studies find that in all sports in a society, people with a current or previous migratory status have lower participation rates than people without such status (Stamatakis and Chaudhury, 2008). Some opinions regarding these results appeal to certain typologies of social and cultural classification of newcomers in a society (Woods & Butler, 2020).

We thus arrive at a category of factors that are more difficult to quantify in a precise manner. Cultural, tardiness and behavioral-human characteristics have been tried to be measured by various indicators (Hofstede, 2011). However, these remain less accurate than socio-demographic and economic characteristics. Empirical studies show that for example in Europe, the gap in mass participation in sports activities is large between the north of the continent and other areas, being the lowest in the Southeast (Liponski, 2017). These differences can only be partially explained by the economic development and sports infrastructure, much of it related to traditions. This result is a global one, on the whole range of activities. If we consider gender and other social characteristics, we can highlight other discrepancies. For example, in some more traditional Balkan countries, there are still preconceived notions about "sports for men" and "sports for women." For example, the first category includes those for muscle development and maintenance, and the second category includes sports that involve elasticity or certain artistic components (Hargreaves, 2014).

Regardless of the country, however, the highest gender equality participation is found in team sports. These cultural interferences are less present in the northern European countries, where there is a balance of participation by sex, in almost all sports.

Income and socio-professional status are essential determinants of participation rates. Almost similar results from most studies show a much higher probability of participation for people with high financial status (Lechner & Downward, 2017). Income acts in two ways. The first way is the direct one, which allows the connection between a high income and the possibility of purchasing season tickets for gyms, terns, swimming pools, participation fees for competitions, etc. The second way, the indirect one, obliges people with high incomes to respect a certain social status, by practicing sports common to those in the same category of financial resources. They are rather involved in sports that are considered more expensive, such as golf or tennis. This is another aspect to consider, of discrimination through practice (Kroshus et al., 2021). In virtually every country, there are still concepts for "sports for the rich" and "sports for the poor." The budget differences required for the practice are large between the cheap sports (running, walking, or cycling) and the expensive ones already mentioned before. However, based on Maslow's „theory of needs", a good and happy life can be only achieved if the needs of individuals are widely met (Mureșan et al., 2019).

Determinants of Sports Development at the Macro Level
The participation mechanisms found at individual level can be the basis for estimating the phenomenon at macroeconomic level, using aggregated national data. For example, instead of the individual's level of education, personal income, or area of residence (urban / rural), literacy rates, percentage of the population with university education, average national salary, income distribution coefficients can be used, urbanization rate, etc. These issues are less studied in the literature than the individual mechanism of participation in sports.

International comparisons are hampered by the fact that from one country to another, empirical studies define very differently what it means to participate in sports activities. There are many divergent opinions of the authors, both in terms of frequency and duration of participation to record the individual's contribution to a sports market (Breuer & Wicker, 2009). If a common time frame can be agreed upon during the activities, it is more difficult to solve the problem of the equivalence of the intensity of the effort. This is due to the very different weight of practicing certain sports from one country to another. There are attempts to equate between different activities that are based on metabolic information, ie the number of calories consumed per unit time. For some countries, especially those that are part of a particular community, it is easier to make comparisons (see for example in Gratton et al., 2011). For example, in the case of the European Union, there are many indicators that are calculated similarly, using the same methodology. Some data on sports are reported as a unit by the same institution, in the case of the EU it is Eurostat. Other economic indicators are calculated identically, allowing their integration in a multivariate study that can explain the associations of sport with economic development, taxation, public health indicators, etc.

Economic development. If, as has been shown at the individual level, a person's financial status encourages his participation in sports activities, it is intuitive that a similar mechanism could lead to a stronger development of sport in richer countries. The phenomenon would not only be due to the aggregation of individual demand but would be more complex. A

country with greater financial possibilities can better develop its sports base (González-Serrano et al., 2019). or to create adequate proximity facilities, bringing an extra attraction for sports.

Income distribution. This determinant can only be studied at the macro level. The mechanism of action on participation in sports could be the following: a society with fewer financial and social discrepancies makes it easier for individuals to meet on sports fields (Veal, 2016), because they are not so far apart from each other in social hierarchy. There are several well-established indicators in the literature that could measure income inequality as a proxy, including the GINI coefficient. Although such a possible factor has not been studied in the literature, we logically and intuitively expect, through the reasoning set out above, that a low concentration of income will have a positive effect on the proportion of sports practiced by the population.

Taxation and redistribution. The role of taxes and duties in a society is at least double, of redistribution and of economic leverage. The state or regional and local institutions may allocate funds in the form of grants to support sports activities. These can be done for both professional and amateur sports. Allocations are instead conditioned by the existence of these funds (Rosner & Shropshire, 2011). A state that collects more than another from its citizens (obviously at the same level of development) will be better able to redistribute money to sports. We therefore expect a higher taxation to encourage mass participation in sports activities, but also to support performance in international competitions.

Public health. This factor is most accepted in academic studies, especially those in the medical field. A sporty population is healthier, and a healthier population does more sports (Malm et al., 2019). The beneficial effects of physical activity on the regulation of blood pressure, cholesterol, blood sugar, and even the human psyche have long been proven.

The motivation of our study is given by the gap in the literature on the existing macroeconomic connections between economic, fiscal, cultural, public health and sports development variables. At the country level, based on aggregate indicators, these relationships have been less studied. The causal relations between the economic and sociodemographic characteristics of the individuals and the intensity of the sport practice by them were preferred. The researchers' preference is given by the difference in complexity between the two approaches. It is difficult to isolate the effect of the successes of medicine (especially in time, in evolution). For example, we have seen in recent decades that the rate of obesity has risen in parallel with the increase in life expectancy. Obviously, the simplistic answer would be wrong if we do not consider other control factors. This is also the case between the relationship between sport and health, which can therefore be studied only in a multivariate context, with the involvement of all possible determinants. The main contribution of our study is the macroeconomic approach of the relations already mentioned, to avoid the distorted effects of multicollinearity. We were able to identify for the analyzed European countries five distinct groups of behaviors regarding the development of sport and its relations with other components of the society.

Objectives and Variables

Our study has the following two main objectives:

- Using as a theoretical basis the cited academic literature and bivariate analysis, we highlight the correlations between the extent of practicing sports and some fiscal, economic, cultural, and public health indicators.
- The use of hierarchical clustering to identify some typical behaviours regarding the development of sport among European countries.

Variables

To measure the different concepts regarding sports, economics, taxation, etc., involved in the studio, we used variables to measure or approximate them. They were selected from mostly well-known internationally variable sources. Because the connections between the phenomena are in most cases nonlinear, it is very difficult to work in each case with logarithmic transformations, power, root, etc. To facilitate this approach, we standardize the variables, by centering and subtracting, then apply the normal distribution and multiply by 10. We obtain values between 0 and 10, which are even easier to interpret, because the transformations are made so that the large values represent the favourable case. Also, in favour of ease of interpretation is the fact that the distribution obtained for the standardized variables is uniformly continuous, with the average value very close to the median value, around 5. All standardized variables use the STD code (for example, STD_ELITE_SPORT).

ELITE_POINTS. The national score obtained in the WRCEC ranking, which measures the performance of all countries based on their international results in all sports recognized by the Global Association of International Sports Federations.

POPULATION. The total population of the country. Source: World Bank (2021).

ELITE_SPORT. Variable obtained as a ratio between ELITE_POINTS and the square root of the variable POPULATION. Preliminary calculations have shown that ELITE_POINTS is more correlated with the square root of the population than with other mathematical transformations of the POPULATION variable. Source: author's calculations.

STD_ELITE_SPORT. Standardized variant of the variable ELITE_SPORT. Source: author's calculations.

AEROBIC. The share of the total population that practices an aerobic sport. Most team sports are included here. Source: Eurostat (2021).

STD_AEROBIC. Standardized variant (between 0 and 10) of the AEROBIC variable. Source: author's calculations.

MUSCULATION. The share of the total population that practices a sport for the maintenance and development of muscles. Eurostat (2021).

STD_MUSCULATION. Standardized variant (between 0 and 10) of the variable MUSCULATION. Source: author's calculations.

STD_PUB_SPORT. Approximates the proportion in which the population does sports in a country. It is the average of the variables STD_AEROBIC and STD_MUSCULATION. Source: author's calculations.

GDPCAP. GDP per capita ($ thousand) is the GDP divided by the population in the middle of the year. Source: World Bank (2018).

STD_GDPCAP. Standardized variant (between 0 and 10) of the GDPCAP variable. Source: author's calculations.

GINI. The Gini Index measures the distribution of income between individuals or households in an economy. Source: World Bank (2021).

STD_EQUAL_INCOME. Standardized variant of the GINI variable (values between 0 and 10). To render income equal for high standardized values, the sign is contrary to the GINI index. Source: author's calculations.

STD_ECONOMIC. Arithmetic mean of the variables STD_GDPCAP and STD_EQUAL_INCOME. Indicates overall economic development, both in terms of level and equity of distribution. Possible values between 0 and 10. High values indicate a more favorable economic development environment for sports. Source: author's calculations.

BASIC_FUND. Basic sports financing (‰ GDP). This represents the total funding for all activities that are contributions to sports plus direct sports activities. Source: EU Publications Office, Study on the contribution of sport to growth and employment in the EU (2018) and national sports institutions in the sampled countries.

STD_BASIC_FUND. The standardized variant of the variable BASIC_FUND, possible values between 0 and 10. High values indicate a more generous financing as a percentage of GDP. Source: author's calculations.

EXTEND_FUND. Extensive financing of sport (‰ GDP). Includes full funding for all activities that require sports as input plus basic funding for sports. Source: EU Publications Office, Study on the contribution of sport to growth and employment in the EU (2018) and national sports institutions in the sampled countries.

STD_EXTEND_FUND. The standardized variant of the variable EXTEND_FUND, possible values between 0 and 10. High values indicate a more generous financing as a percentage of GDP. Source: author's calculations.

STD_SPORT_FIN. It is the simple arithmetic mean of the variables STD_BASIC_FUND and STD_EXTEND_FUND. In order not to create ambiguities in the analyzes carried out by using two indicators regarding the financing of sports, one was built, which takes information from the initial indicators. Possible values between 0 and 10, high values indicating generous financing. Source: Author's calculations.

FISCAL_GDP. It is a measure of the total fiscalization of the economy. It is obtained from the sum of all collections of taxes at national, regional, and local level as a percentage of GDP. Source: Eurostat (2021).

STD_FISCAL_GDP. Standardized variant (values between 0 and 10) of the variable FISCAL_GDP. High values indicate a high degree of taxation of the economy by collecting taxes and duties. Source: author's calculations.

STD_FISCAL. Composite standardized variable, obtained as the average of the variables STD_SPORT_FIN and STD_FISCAL_GDP. Possible values between 0 and 10. High values indicate a favorable fiscal situation for sports, both by collecting higher taxes and by distributing them to support sports activities.

LIFE_EXP. Life expectancy at birth indicates the number of years a newborn would live if the predominant mortality rates at the time of birth remained the same throughout life. Source: World Bank (2021).

STD_LIFE_EXP. Standardized variant of the variable LIFE_EXP, with possible values between 0 and 10. Source: author's calculations.

HEALTH_GDP. Total financing of health, as a percentage of GDP. All sources of financing are included here: direct budget allocation, national health insurance houses, other health houses such as professional ones, voluntary private insurance, direct and co-paid payment. Source: World Bank (2021) and Eurostat (2021).

STD_HEALTH_GDP. The standardized variant of the variable HEALTH_GDP, with values between 0 and 10. High values indicate a high relative financing (percentage of GDP) of the health care system. Source: author's calculations.

STD_HEALTH. Composite standardized variable, obtained as the average of the variables STD_LIFE_EXP and STD_HEALTH_GDP. Possible values between 0 and 10. High values indicate a favorable public health situation for sports, both through the health and longevity of the population, and through the ability to financially support the medical system.

STD_CULTURAL. Composite standardized variable, based on three of Hofstede's six indicators (2011): Power Distance Index (PDI), Uncertainty Avoidance Index (UAI) and Indulgence versus Restraint (IND). The explanation of the selection of indicators and their mode of aggregation is given in the analysis section related to cultural factors. Source: author's calculations based on Hofstede's cultural indicators (2011).

Results and Discussion
The list of the 32 countries in the sample includes the states of the European Union, plus United Kingdom, Iceland, Switzerland, Norway and Turkey, respectively: Austria (AT), Belgium (BE), Bulgaria (BG), Croatia (HR), Cyprus (CY), Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (GR), Hungary (HU), Iceland (IS), Ireland (IE), Italy (IT), Latvia (LV), Lithuania(LI), Luxemburg (LU), Malta (MT), Netherlands (NL), Norway

(NO), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), Switzerland (CH), Turkey (TR) and United Kingdom (UK).

Bivariate Analysis in Relation to Sports and Sports Performance
Based on the theoretical arguments presented regarding the logical correlations between the development of sport and other socio-economic aspects, we treat successively these connections, on databases at the level of European countries. Both amateur sports, through the percentage of practice practiced by the population, and professional sports, through the national sports performances at large-scale competitions, are considered.

The connection of sport with economic development. Economic development and the structure of an economy are very complex concepts. However, we synthesized these concepts through two variables: GDP per capita and the GINI coefficient of income inequality. Their mechanism of action on sport has already been explained in theoretical approach. Figure 1 shows a strong positive correlation between the percentage of sports and GDP per capita. This result is in accordance with theory and intuition. We note in the top the Nordic countries and other highly developed countries: Iceland, Norway, Denmark, Luxembourg, Sweden, or Switzerland, which have high values for both indicators. At the opposite pole are poorer Europeans: Romania, Bulgaria, or Turkey. However, there are deviations from this mechanism. In some countries the population does a lot of sports in relation to the economic level, exemplary from this point of view being Slovenia. Instead, there are countries with smaller proportions than the economic level allows: Italy, France, or Ireland. In terms of income equality, the theoretical mechanism seems to be respected. That is, the financial homogeneity of the citizens makes it easier for them to meet on the same sports grounds, there is less frustration regarding the financial possibility to access the same equipment. For public sport (figure 2) we notice the positive correlation, even if it is less obvious than in the case of GDP. The Nordic countries stand out again with high values for both indicators: Iceland, Norway, Sweden, Denmark, and Finland. They are closely followed by Slovenia, the Netherlands and Austria. These nations are deliberately pursuing a social policy that has a beneficial effect on sport. In contrast, Romania, Turkey, and Bulgaria have major social inequities, which discourage the massive participation of citizens in sports. Switzerland, Germany, and Luxembourg have a substantial population involvement, despite average inequalities in financial resources among citizens. Remarkable, however, is the position of Poland, Croatia, Estonia, and Cyprus, in which the population does little sport compared to what they could afford in terms of inequality. Of course, the result can be caused by other factors, such as certain cultural characteristics.
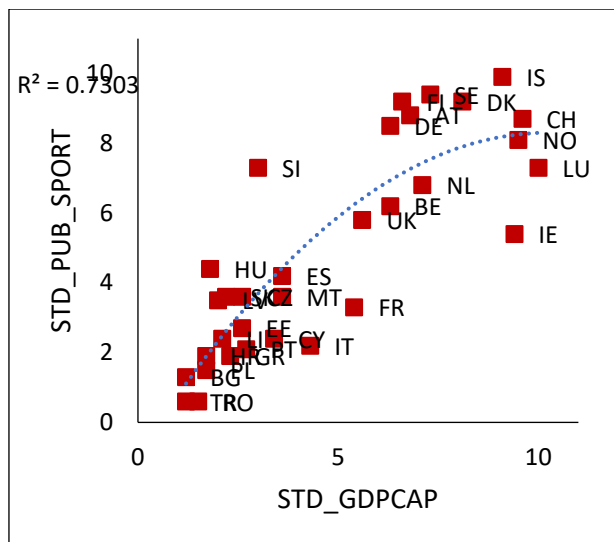
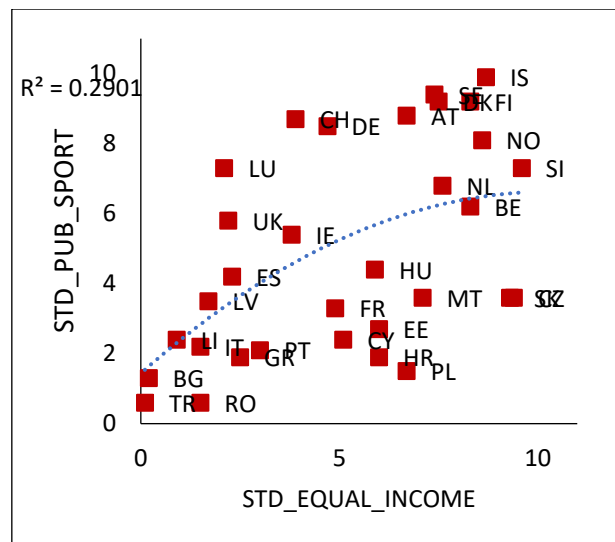Fig. 1: The correlation between GDP and the share of sports in European countries

Fig. 2: The correlation between income equality and the share of playing sports in European countries

The connection of sport with financing and taxation. From the stage when sport began to include trade relations and then to become an economic sector, its evolution was linked to financial flows. The connections can be primarily with the inflows into the market through state subsidies and funding, sponsorships, and volunteering. However, some of them are also conditioned. Government authorities cannot distribute if they do not collect. To study the effect of these fiscal flows, we evaluate the effect of two indicators: the financing of sport as a ratio of GDP (basic and extensive) and the total budgetary revenues from fiscal taxes as a ratio of GDP. Figure 3 analyzes the correlation between government funding for sport and the practice of sport by citizens. The correlation is direct and quite strong, meaning that the rightly directed financial flows have achieved their goal of boosting the sports movement. On the leading places we find the developed countries, mostly from the north: Iceland, Norway, Austria, Denmark, Finland, Luxembourg, Germany, or Switzerland. In the area with low values for both indicators are Turkey, Romania, Bulgaria, Poland, and Lithuania. The correlation between the variables is quite consistent. There are no notable exceptions to these connections, the outlier values are not large and do not show a significant regional grouping. After discussing the results regarding the influence of sports financing, it is interesting to see what can determine those allocations of funds. It is mainly about fiscal capacity, ie what can actually mobilize a country as financial resources to be able to finance in the end sports for other social destinations. In figure 4 we examine the effect of the company's taxation on public sports. The correlation is positive and linear, even if of lower intensity. The countries that perform very well are Sweden, Denmark, Finland, and Austria. They are generally nations recognized for their fiscal capacity and redistributive capacity. The identified correlation shows concrete plans to manage public finances correctly in terms of volume and structure. Not to mention, we find at the opposite pole the poorest countries in Southeast Europe. However, the exceptions to the correlation found are very numerous. There are nations with wide sports participation, without attracting funds through consistent taxation, but also vice versa. In addition, there is no significant geographical association with these rules or behavioral exceptions.
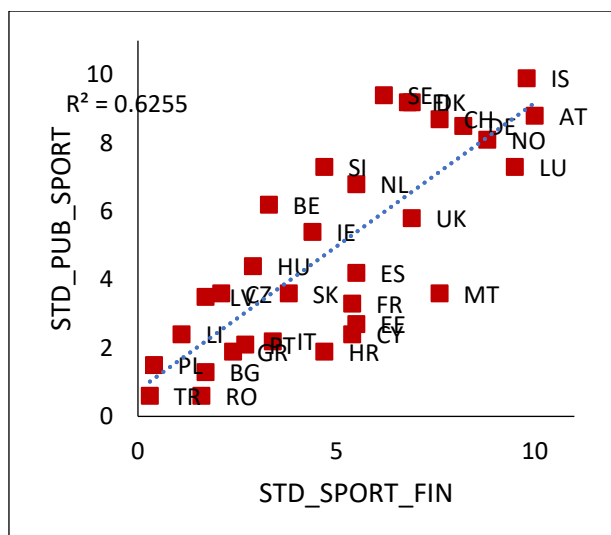
Fig. 3: The correlation between the financing of sports and the share of sports in European countries
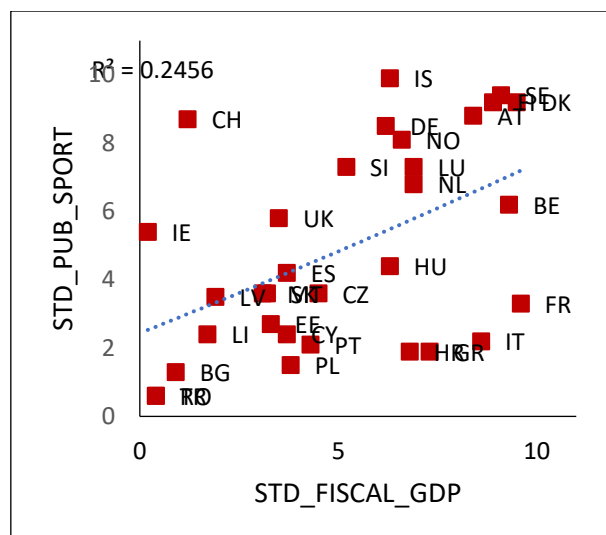

Fig. 4: The correlation between the fiscal revenues from the GDP and the share of practicing sports in European countries

The connection of sport with public health. As we mentioned in the theoretical approach, there are many studies, especially medical ones that demonstrate the beneficial effects of sport on personal health. If we look at it, at a national level, we can see biunivocal relationships, that is, a healthier population does more sports, and more sports brings better health. Public health can be viewed from several perspectives. We can talk about the factors that determine it, such as a competitive and well-funded medical system. We can also talk about health and longevity measures. Figure 5 analyzes the relationship between longevity and the share of the population practicing sports activities. It is interesting that although the correlation is direct, its intensity is lower than we would have expected if it is lower than the one with economic development. We can only assume that much of the behavior has other determinants. A great value of sportsmen can be decided by human cultural and behavioral factors. Conversely, good health can be largely due to a good medical system, in addition to physical activity. However, we find the same favorable behavior of the Nordic and developed countries (Iceland, Sweden, Norway, and Switzerland). The very low values of both indicators are recorded in the Southeast European countries, former communists, to which Turkey is added. A unique group includes Cyprus, Portugal, Greece, Malta, France, Italy, Spain. All these are Mediterranean countries, in which the high life expectancy is not associated with a large proportion of the sports population. It is very possible that in addition to a correct medical system, specificities regarding the diet are also involved.

The connection of sport with national cultural characteristics. It seems that any economic, fiscal, or public health variable we use, remains a consistent unexplained part of the mechanism that favors directing the population to sports. There are personal inclinations and beliefs in everyone. However, their aggregation at the national level is even more difficult. Among the studies that have tried to synthesize individual behaviors at the aggregate level, the most recognized in the literature is that of Hofstede (2011). It summarizes six indicators that can synthetically capture the average of human behavioral characteristics at the level of a nation: (C1 - PDI) distance from power, (C2 - IDV) individualism versus collectivism, (C3 - MAS) masculinity, (C4 - UAI) avoidance uncertainty, (C5 - LTO) long-term versus short-term orientation, (C6-IND) indulgence versus restraint. A separate approach to the influence of

each on sport (separately amateur and professional) would be too laborious and would go beyond the scope of the analysis in this research. We will thus limit ourselves to a single analysis based on a composite indicator, which aggregates Hofstede's makers. The aggregation is done on average, considering the sign of their influence on the sport (table 1), from the correlation matrix. We consider only the C1, C4 and C6 factors that have greater influences on sports. The aggregate indicator that measures cultural characteristics is denoted STD_CULTURAL. We notice in figure 6 the very strong positive effect of the combined cultural characteristics on the public sport. And in this case, there is a very strong dissociation between the Nordic countries and those in the southeast of the continent. However, a group of countries above the level of the regression function can be seen at the top of a table. These are developed countries, whose financial level allows them a good accessibility to sports, above the level established by cultural factors (Luxembourg, Germany, Switzerland, Austria, Finland, Iceland). Under the regression function, the countries where the public does less sports compared to the cultural level are less geographically and economically homogeneous: Turkey, Greece, Italy, Lithuania, Estonia.
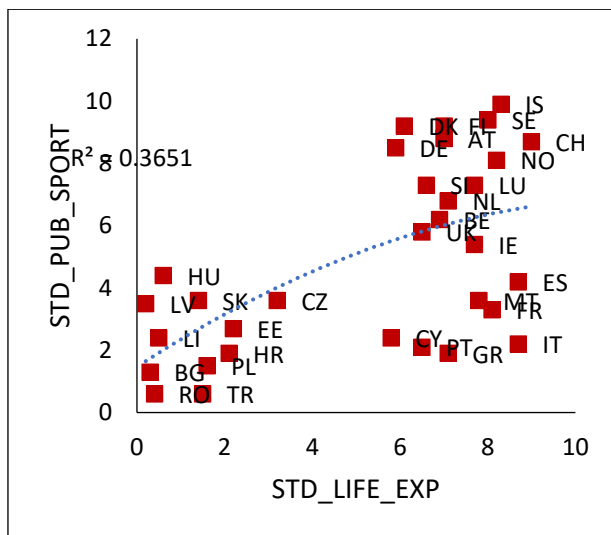

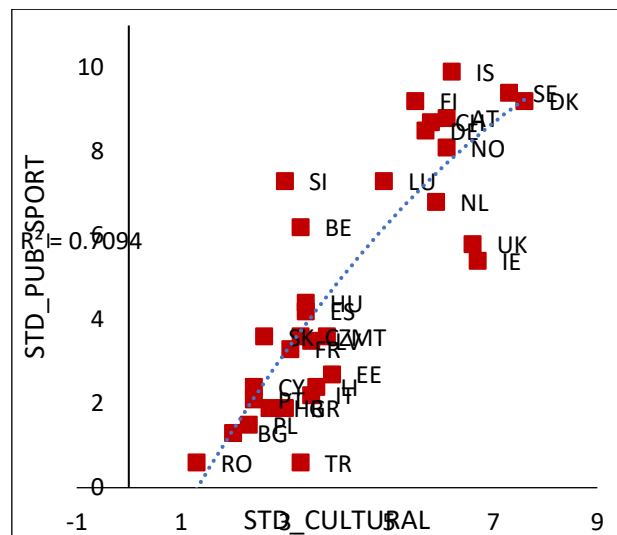Fig. 5: The correlation between life expectancy and the share of playing sports in European countries

Fig. 6: The correlation of cultural factors and the share of sports in European countries

Table 1
Pearson's correlations between standardized variables for sports and Hofstede's cultural indicators (own calculations)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
STD_PUB_SPORT (1)	1.00							
STD_ELITE_SPORT (2)	0.38	1.00						
PDI (3)	-0.71	-0.19	1.00					
IDV (4)	0.48	0.30	-0.59	1.00				
MAS (5)	-0.22	-0.30	0.24	0.07	1.00			
UAI (6)	-0.62	-0.39	0.63	-0.59	0.21	1.00		
LTO (7)	-0.10	0.14	0.15	0.17	0.23	0.07	1.00	
IND (8)	0.78	0.14	-0.58	0.42	-0.09	-0.46	-0.31	1.00

Multivariate Analysis - grouping European Countries by Clustering
In the previous bivariate Analyzes we were able to identify some interesting correlations of public sport and performance with economic, fiscal, cultural, and public health factors. They only showed the complexity of the phenomena considered, especially since those components are not independent of each other, but linked by collinear phenomena. To address existing dependencies more correctly and completely, we use hierarchical clustering, which allows us to place countries in several behavioral categories using several variables simultaneously. We apply hierarchical clustering, using the Euclidean distance between the centroids of the groups (Ward linkage). The number of groups was established by the ANOVA method so that the variance on all variables is minimal in groups and maximum between groups.

We include all components in the analysis simultaneously. However, the number of variables would be too large, and difficult to analyze, interpret and comment on their values in groups. Therefore, we use composite variables in the analysis, one for each of the four analyzed aspects, respectively: STD_ECON, STD_FISCAL, STD_HEALTH and STD_CULTURAL. Figure 6, Figure 7 and Table 2 show geographically and statistically the results of clustering. Five groups resulted from the empirical analysis of the dendrogram and the application of ANOVA.

Table 2
Median values of clustering in relation to sport and composite variables for economic development, taxation, cultural characteristics and public health

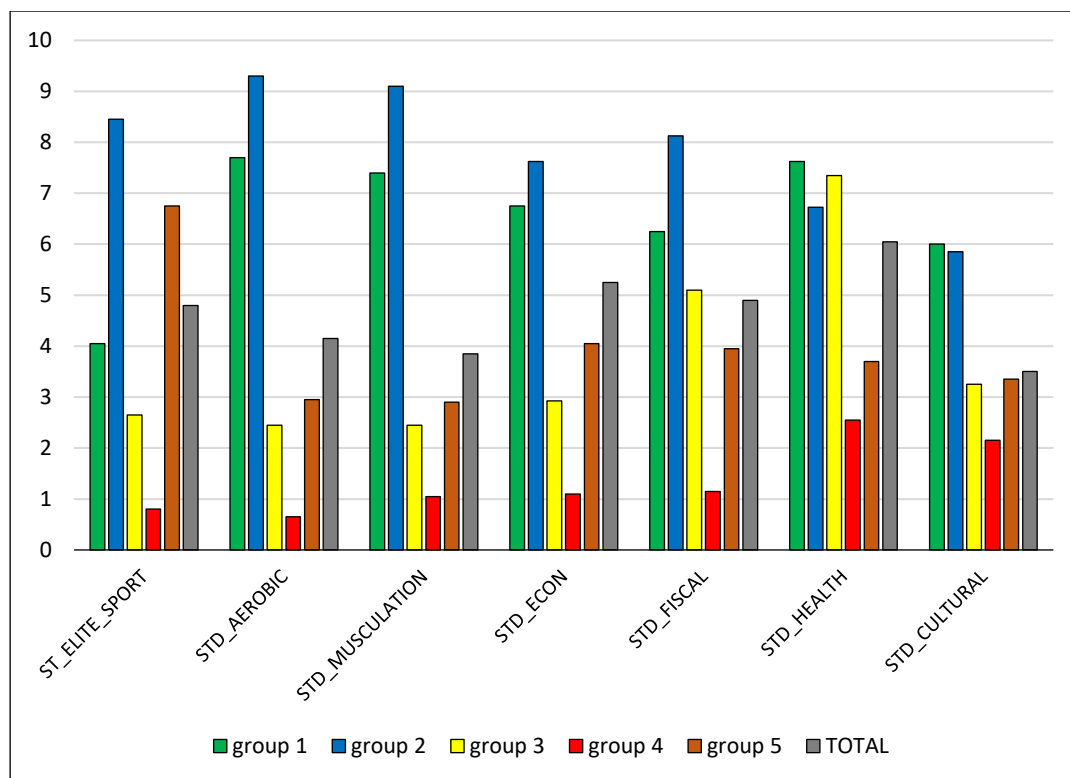|	Group 1	Group 2	Group 3	Group 4	Group 5	TOTAL
STD_ELITE_SPORT	4.05	8.45	2.65	0.80	6.75	4.80
STD_AEROBIC	7.70	9.30	2.45	0.65	2.95	4.15
STD_MUSCULATION	7.40	9.1	2.45	1.05	2.9	3.85
STD_ECONOMIC	6.75	7.62	2.92	1.1	4.05	5.25
STD_FISCAL	6.25	8.12	5.10	1.15	3.95	4.90
STD_HEALTH	7.62	6.72	7.35	2.55	3.7	6.05
STD_CULTURAL	6.00	5.85	3.25	2.15	3.35	3.50

Fig 7: Representation of median values from global clustering with all variables

There is no absolute stratification identified between groups. The first group dominates the ranking of public health and cultural factors. However, it is surpassed by the second group in terms of economic, physical, sports performance and public involvement in sports activities. The third group seems to be one with average values, but with inconsistencies. The values of international sports performance and the percentages of practicing sports by citizens are mediocre, instead it has values above average for public health indicators. The fifth group excels in international sports, despite the values below average for other sports, cultural, economic, fiscal, and public health indicators. The fourth group can be identified best from a behavioral point of view. It records the lowest values for all indicators.

Geographically, groups 1 and 2 include only developed countries in the north of the continent that speak English and German. In the third group are only Mediterranean countries. They have high public health values, despite their poor professional performance and moderate public participation in sports activities. Good levels of health and longevity may be due in large part to a Mediterranean diet recognized for its benefits. In groups 4 and 5 are exclusively countries from Eastern and Southeastern Europe. However, there is a distinction between them, which is made mostly by different levels of development, the poorest being in the fifth group.
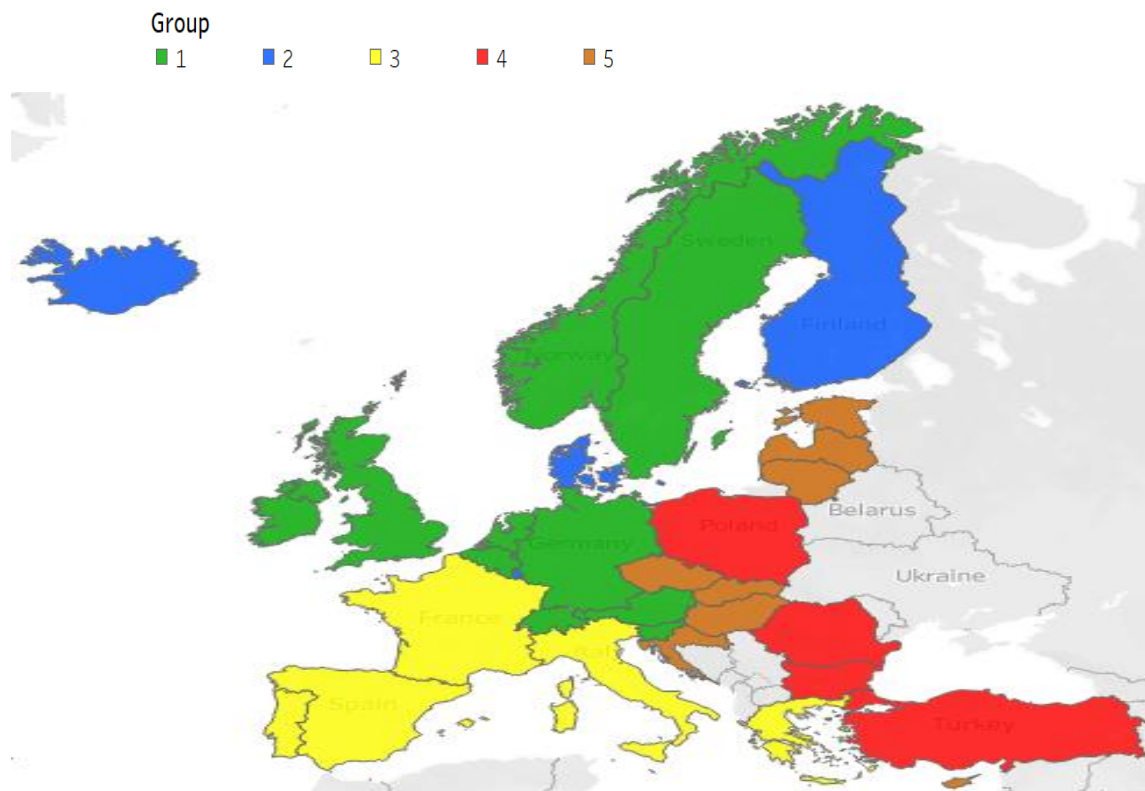
Fig. 8: Geographical distribution of clustering in relation to sport and composite variables for economic development, taxation, cultural characteristics, and public health

Conclusions

The main contribution of our study is the identification of behavioral groups distinct from European countries in terms of the development of sport. Moreover, this development is not considered individually in the five groups, but in relation to several macroeconomic indicators. However, to justify the inclusion of each indicator in the clustering analysis, we first performed some bivariate analyzes between each type of factor and the development of the sport. Bivariate analyzes indicated associations of public sports development with various economic, fiscal, cultural, and public health aspects. Hofstede's gross domestic product, inequality in income distribution, fiscal capacity, sports funding, share of health funding in GDP, life expectancy and cultural factors were also investigated. However, bivariate analyzes have their limits. There are strong correlations between the indicators used, which disturbs the visualization of the effect of each. The multivariate analysis, performed by clustering indicates the existence of five quite homogeneous groups regarding the behavior of the relationship between sport and other macroeconomic aggregates. The group also has a geographical character, with clear distinctions between the north, west and southeast of the continent, respectively. The results of the study can be used by the national governments of European countries to better understand their position in relation to other countries. Appropriate policies can thus be developed to guide legislative and financial incentives in the desired direction for sport and public health.

Aknowledgement

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