Original Article

Impact of economic conditions on the physical activity of regional communities in Poland

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Abstract:

From the point of view of making economic and financial decisions in the sphere of sport by public authorities, an interesting issue is to determine the factors affecting the diversity of physical activity of residents in individual parts (provinces) of the country. The research objective of the article is to verify the impact of selected economic conditions on sport activity in the provinces of Poland measured by the number of persons attending sports clubs per 1,000 inhabitants. To determine the relationship between the number of people practising in sports clubs per 1,000 inhabitants (the dependent variable) and the explanatory variables, a static panel model was used based on the data derived from the Central Statistical Office for all of the 16 Polish provinces for the 2002-2018 time period, after adjusting to the two-year cycle of publishing sports activity data. Intentionally, not only purely financial variables were included in the set, but also economic and demographic ones. Among the explanatory variables, which proved statistically significant in the model, the negative impact of the registered unemployment rate on activity in sports clubs can be the result of both economic factors, as well as purely psychological. Both the economic and the psychological income barrier, already mentioned in the context of unemployment, can be treated as a link with the other two statistically significant explanatory variables that are associated with the financial capabilities of the regional authorities of the province. Both targeted grants from the state budget per capita in Polish zloties and the general subsidy from the state budget per capita in Polish zloties testify to the dependence of the possibility of developing activity in sports clubs in Polish provinces on the financial support obtained by the provincial government from the central government. The above considerations lead to the conclusion that the most important for the development of organized physical activity of the society in Poland is the tendency of the province's community to exercise in sports clubs in conjunction with the activity of local authorities in raising funds to finance club activities and develop sports infrastructure.

KeyWords: physical activity, regional differentiation, demographic conditions, income conditions

Introduction

The issues of the impact of physical activity of a given society on its health condition are of interest to both public authorities and researchers (Breda et al., 2018). At the same time, in many countries, the popularity of practising sports has contributed to the development of the entire market of dedicated products and services, thus creating a significant economic subsector (European Commission, 2012).

In this context, it is advisable to conduct research on financial and non-financial economic factors that may positively or negatively affect the propensity of society and its various groups to sporting activity (Widdop&Cutts, 2013). From the point of view of making economic and financial decisions in the sphere of sport by public authorities, an interesting issue is to determine the factors affecting the diversity of physical activity of residents in individual parts (provinces) of the country (Valérie & Bernard, 2016)..

The substantive separation of physical activity in the form of amateur sport from recreation is difficult to carry out in certain areas and has a contractual nature (Cushman&Laidler, 1990; Exel et al. 2019). This is also reflected in the detailed data available, particularly in those collected based on surveys made (Eurostat, 2018). For the purposes of this article, an institutional approach was adopted, i.e., the focus was on physical activity organized in sports clubs.

The research objective of the article is to verify the impact of selected economic conditions on sport activity in the provinces of Poland measured by the number of persons attending sports clubs per 1,000 inhabitants.

In the analysed case of Polish sports clubs, there are no data on the number of sports club members who practise sports professionally. However, given that the data used in the article and obtained from Poland's Central Statistical Office (CSO) apply to all types of sports clubs and all those exercising in these clubs, it must be stated that the share of those practicing professionally is small. In 2018, there were 14,772 clubs in Poland,

where 1,056,142 people were actively involved in sports (CSO). More detailed information on the data used in the article is included in its further part.

This article does not discuss the health benefits of different types of physical activity. According to previous findings described in the subject literature, it is assumed a priori that amateur sport is generally beneficial to the health of exercisers, though to a degree depending on the type and manner of practising a given discipline (Booth, Rowlands&Dollman, 2015; Hulteen et al.2017; WHO, 2018).

Focusing on the economic conditions for diversifying sport activities in individual Polish provinces indicated for the purpose of the article, the authors had to select, which is always potentially controversial, certain factors (explanatory variables) from a wide range of features differentiating individual provincial (CSO). Intentionally, not only purely financial variables were included in the set, but also economic and demographic ones. These include: 1) density of population, 2) expenditure per capita in households, 3) percentage of working-age population, 4) number of people in post-working age per 100 people in working age, 5) registered unemployment rate, 6) own income per capitaby province (in Polish zloties, PLN), 7) targeted grants from the state budget per capita (in Polish zloties, PLN), 8) general subsidy from the state budget per capita (in Polish zloties, PLN).

To determine the relationship between the number of people practising in sports clubs per 1,000 inhabitants (the dependent variable) and the above explanatory variables, a static panel model was used based on the data derived from the Central Statistical Office for all of the 16 Polish provinces for the 2002-2018 time period, after adjusting to the two-year cycle of publishing sports activity data.

Due to the innovative nature of the research conducted and its geographical scope, the article abandoned a separate section devoted to the review of the literature concerning the nature of the topic undertaken. The macroeconomic conditions of the territorial diversity of sport activities in clubs have not yet been considered in fact and constitute a research gap in the above issue. Kraminet al.(2019)is one of the few works considering the topic. First of all, the relevant economic, statistical and econometric publications necessary for the proper construction of the appropriate model and interpretation of its results were used.

Material & methods

In the article, a panel model was used to describe the relationship between the number of people practising sports per 1,000 inhabitants and the demographic and income conditions present in the provinces of Poland.

The theoretical model takes the following form:

$$Y_{jt} = \alpha_0 + \alpha_1 X_{1jt} + \alpha_2 X_{2jt} + \alpha_3 X_{3jt} + \alpha_4 X_{4jt} + \alpha_5 X_{5jt} + \alpha_6 X_{6jt} + \alpha_7 X_{7jt} + \alpha_8 X_{8jt} + v_{jt} \quad (1)$$

$$v_{jt} = e_t + u_j + \varepsilon_{jt},$$

(2)

Table 1 presents a description of the individual variables used in the study.

Table 1. Variables used in empirical investigation

Variables	Variables description (data for provinces of Poland)
Y_{jt}	The number of people exercising in sports clubs per 1,000 inhabitants
Explanatoryvariables	
X_{1jt}	Density of population
X_{2jt}	Expenditure per capita in households (in Polish zloties, PLN)
X_{3jt}	Percentage of working-age population
X_{4jt}	Number of people in post-working age per 100 people in working age
X_{5jt}	Registeredunemploymentrate
X_{6jt}	Province's own income per capita (in Polish zloties, PLN)
X_{7jt}	Targeted grants from the state budget per capita (in Polish zloties, PLN)
X_{8jt}	General subsidy from the state budget per capita (in Polish zloties, PLN)
v_{jt}	The random error in the object j, in the time period t, which consists of the following components: e_t – impulses affecting all observations in the time period t, u_j – impulses affecting all the observations in the object j, ε_{jt} – impulses affecting only observations in the object j, in the time period t.

Source: elaborated by the authors.

The data used to estimate the model were obtained from the CSO database. The data were collected for all of the 16 Polish provinces. They relate to nine two-year periods and cover the 2002-2018 time period. The panel used in the work is classified as balanced panels, i.e., panels composed of information on a permanent group of objects, in this case the 16 provinces of Poland, throughout the entire period analysed.

However, they should be distinguished from unbalanced panels (Osińska 2007, p. 410), i.e., those in which a group of objects in the period under study is subject to change (that means that new objects are added or some objects are removed).

A statistical description of the explained variable and explanatory variables for 2018 is presented in Table 2.

Table 2. Statistical description of variables for 2018

Variables	Median	Average	Maximum	Minimum
The number of persons practising sports per 1,000 inhabitants	27.88	27.29	18.48	36.10
Explanatory variables				
Density of population	116.50	128.94	59.00	368.00
Expenditure per capita in households (in Polish zloties, PLN)	1624.18	1645.26	1347.26	2031.59
Percentage of working-age population	60.75	60.81	59.40	62.00
Number of people in post-working age per 100 people in working age	35.05	35.12	32.00	39.90
Registered unemployment rate	6.20	6.54	3.20	10.40
Province's own income per capita (in Polish zloties, PLN)	2502.22	2543.28	1648.40	3982.80
Targeted grants from the state budget per capita (in Polish zloties, PLN)	1240.09	1241.50	998.24	1478.14
General subsidy from the state budget per capita (in Polish zloties, PLN)	1181.86	1143.65	930.93	1356.09

Source: elaborated by the authors.

Results

Table 2 presents the average number of persons practising sports per 1,000 inhabitants in individual provinces of Poland.

In the years 2002-2018, the average number of persons practising sports per 1,000 inhabitants in Poland's 16 provinces was 23.26. The lowest number in the analysed period was recorded in the following provinces: świętokrzyskie and mazowieckie. The highest number of persons practising sports per 1,000 inhabitants was recorded in the podkarpackie and the małopolskie provinces.

Table 3. The average number of persons practising sports per 1,000 inhabitants in individual provinces in Poland (two-year data covering the 2002-2018 period)

Province	The average number of persons practising sports per 1,000 inhabitants	Province	The average number of persons practising sports per 1,000 inhabitants
Dolnośląskie	22.90	Podkarpackie	33.34
Kujawsko-Pomorskie	22.65	Podlaskie	23.02
Lubelskie	23.13	Pomorskie	21.30
Lubuskie	25.16	Śląskie	21.47
Łódzkie	22.28	Świętokrzyskie	16.60
Małopolskie	29.08	Warmińsko-Mazurskie	21.60
Mazowieckie	19.66	Wielkopolskie	22.68
Opolskie	22.01	Zachodniopomorskie	25.33

Source: own calculations based on CSO data.

The choice of the estimation method was made based on the decision procedure presented in the literature in the field of econometrics (Baltagi, 2001; Kufel, 2007, pp. 166 and 170-171; Maddala, 2006, 2008, pp. 649-650; Osińska, 2007, pp. 416-418). First, a simple panel model (without individual effects) was estimated using the classic least squares method, and diagnostic tests of the model were performed.

Table 4 presents the results of the Wald, Breusch-Pagan and Hausman tests on the basis of which the decision to choose the right model is made. These tests allow one to verify the assumptions about the correct estimation of the panel model.

Table 4. Diagnostic test results

Test	Hypotheses	Test statistics	p value	Decision*
The Wald test	H_0 : equal absolute terms of the model regardless of the object and time (the KMNK estimator) H_1 : different absolute terms for individual objects, but constant in time (the FE estimator)	$F = 15,9465$	$p \approx 0,000$	Rejection of H_0
The Breusch-Pagan test	H_0 : variance of the random component of individual effects does not differ significantly from zero (the KMNK estimator) H_1 : variance of the random component of individual effects differs significantly from zero (the RE estimator)	$LM = 174,9440$	$p \approx 0,000$	Rejection of H_0
The Hausman test	H_0 : both FE and RE estimators are unbiased (the RE estimator is more effective) H_1 : the FE estimator is unbiased, while the RE estimator is biased (the FE estimator)	$X^2 = 14,3337$	$p \approx 0,000$	Rejection of H_0

* The adopted level of significance is 0.10 (i.e., $\alpha = 0.10$). Source: own calculations.

Analysing the Wald test results, it can be stated that the correct model describing the dependence between economic and demographic factors and the number of people exercising is the fixed effects model (FEM). The results of the Breusch-Pagan test indicate the model with random individual effects (REM - random effects model) as a better model. Finally, the results of the Hausman test allow us to conclude with the assumption of a risk of error at the level of 10% ($\alpha = 0.10$) that the model with established individual effects (FEM) is appropriate for the description of the tested dependence. However, further analysis confirmed the occurrence of heteroscedasticity of the random component in this model. In order to remove this drawback, the weighted least squares (WLS) method was used to estimate the model parameters. Table 5 presents the results of the above model estimation.

Table 5. Estimation results of the model estimated using WLS

Dependent variable Y_{jt}					
Independent variables	Coefficient	Std. Error	t-ratio	p-value	Significance (a)
Constant	18.3644	1.53729	11.95	4.07e-023	***
X_{5jt}	-0.135596	0.0465378	-2.914	0.0042	***
X_{7jt}	0.00427345	0.00110339	3.873	0.0002	***
X_{8jt}	0.00441242	0.00184790	2.388	0.0183	**
Observations		144			
Sum of squared residuals (for weighted data)		130.5165			
Residual Standard Error (for weighted data)		0.965536			
Coefficient of determination R^2 (for weighted data)		0.549827			

a)*** The statistically significant variable at the level of 1% ; ** at the level of 5%.

Source: the authors' own calculations.

The estimated model is statistically correct. Three out of eight potential explanatory variables proved statistically significant. All of the obtained signs of structural parameters assessments for the explanatory variables are consistent with the theory of economics.

The results obtained show that two explanatory variables, i.e., targeted grants from the state budget per capita and the general subsidy per capita, have a positive effect on the explained variable (i.e., the number of people practising sports per 1,000 inhabitants). One explanatory variable (i.e., registered unemployment rate) has a negative impact on the dependent variable. The assessment of the parameter with the independent variable X_{5jt} (-0.135596) should be interpreted as follows: if the registered unemployment rate increases by 1 percentage point, then the number of people practising sports per 1,000 inhabitants will result in a decrease by an average of approximately 0.1356, assuming the stability of other variables. The interpretation of the parameter assessment with the explanatory variable X_{7jt} (0.00427345) should be as follows: if the targeted grants from the state budget per capita increase by PLN 1, then the number of people practising sports per 1,000 inhabitants will increase by about 0.0043 on average, assuming the stability of the remaining variables.

The assessment of the parameter with the independent variable X_{8jt} (0.00441242) has the following interpretation: if the general subsidy per capita increases by PLN 1, then the number of people exercising per 1,000 inhabitants will increase by approximately 0.0044 on average, assuming that the remaining variables remain constant.

Discussion

Treating sport as generally conducive to health, though to a degree depending on its type and manner of practising, and recognizing the economic significance of sport activity, it should be recognized as a positive and socially important phenomenon (González-García et al., 2018; Chacón-Araya, Villarreal-ángel & Moncada-Jiménez, 2018; Di Palma et al., 2018). Before discussing the results of the study, information will be provided on the specificity of sports activity being studied, creating a more detailed context for the comments made.

As was aforementioned, the sports activity of the population in different parts of the country can be measured and compared, also by means of using the indicator of the number of people practising sports in clubs per 1,000 inhabitants in a given part of the country.

For proper interpretation of the results, it is worth noting that the model uses both data on sports clubs (including clubs belonging to the Ministry of National Defense and the Ministry of Internal Affairs and Administration, various denominations including the Salesian SALOS clubs and university sports clubs) and those practising in sport sections by discipline. An individual can be counted only once, regardless of the number of disciplines practised. Since 2002, these data have been published by the Central Statistical Office every two years.

In Poland, the largest territorial division units are provinces which are also referred to as 'voivodships'. Poland is divided into 16 provinces, of which the largest one (the mazowieckie province) has 5.4 million

inhabitants and 35.6 thousand km² of area, and the smallest one (the opolskie province) has 0.99 million population and 9.4 thousand km². The population density in the provinces ranges from 59 people per km² (the podlaskie and warmińsko-mazurskie provinces) to 368 people per km² (the śląskie province). This means that the provinces are very different territorial and population units of the administrative division of the country, and also the largest local government units (regional level, almost coinciding with the NUTS 2 classification used by the European Union). To limit the impact of this differentiation between provinces on the model's relevance, measures per unit (e.g., 'per capita' or 'per 100 inhabitants') were adopted as explanatory variables, and not the basic nominal values.

Among the explanatory variables, which proved statistically significant in the model, the negative impact of the registered unemployment rate (X_{5jt}) on activity in sports clubs can be the result of both economic factors (for example, lower income of the unemployed and uncertainty about the financial future, stimulating them to reduce spending), as well as purely psychological (a sense of alienation from society, loss of motivation for physical activity, see Goldsmith, Veum & Darity, 1996, Darity & Goldsmith, 1996 and Drydakis, 2014). The results of the presented model suggest that factors of this type may have a stronger impact than having more time for the unemployed to engage in sports compared to working people.

Both the economic and the psychological income barrier, already mentioned in the context of unemployment, can be treated as a link with the other two statistically significant explanatory variables that are associated with the financial capabilities of the regional authorities of the province. Both targeted grants from the state budget per capita in Polish zloties (X_{7jt}) and the general subsidy from the state budget per capita in Polish zloties (X_{8jt}) testify to the dependence of the possibility of developing activity in sports clubs in Polish provinces on the financial support obtained by the provincial government from the central government.

Against this background, one can explain why a province's own income per capita in Polish zloties (X_{6jt}) turned out to be a statistically insignificant explanatory variable. These provincial-level own revenues are obtained mainly as a percentage share in PIT and CIT income taxes collected by the state budget. Provinces, similar to counties, which are intermediate local government units, are not assigned their own tax revenues. Only the lowest level of local government, i.e., communities, obtains income from local taxes, such as property tax, tax on means of transport, agricultural tax, forest tax.

There is a significant difference between the structure and activity of both central and local authorities and between targeted grants and the general subsidy. Targeted grants are awarded by ministries or other organizational units of central authorities to a local government unit at its request, on a discretionary basis, and may be subjective (assigned to an institution or enterprise) or objective (assigned for a product or service). The general subsidy, in turn, is calculated according to the formula included in the act on the income of local government units, i.e., if a given self-government meets the criteria set out in the act, then the money is due to it in the amount resulting from the formula and the central government is obliged to transfer funds in this amount. The abovementioned differences mean that local government authorities who want to increase the activity of their residents in sports clubs through greater funding of clubs' activities and improvement of sports infrastructure in their area should first of all intensify their efforts aimed at the obtainment of targeted grants from central government funds.

Admittedly, the research objective of the article is to verify the impact of selected economic conditions on sports activity in the Polish provinces, but the explanatory variables also include population density (X_{1jt}). The variable was used to test the correctness of the model, as preliminary data showed that the population density in the provinces should not be related to the activity of residents in sports clubs. The province with the lowest population density (the warmińsko-mazurskie province, 59 people per km²) and the province with the highest population density (the śląskie province, 368 people per km²) have almost identical numbers of people practising in sports clubs per 1,000 inhabitants (the multi-year average was 21.60 and 21.47 respectively - see Table 3). Another example, the wielkopolskie province has a population density similar to that of the kujawsko-pomorskie and podkarpackie provinces (117, 111 and 116 people per km², respectively). However, in terms of the number of people practising in sports clubs per 1,000 inhabitants, the wielkopolskie province with the long-term average of 22.68 is on the same level as the kujawsko-pomorskie province (22.65), but both these provinces lag far behind the podkarpackie province (33.34). Provinces with similar population density can significantly differ in other characteristics that affect the popularity of practising in sports clubs. Thus, according to the preliminary predictions, it turned out that population density is not a statistically significant factor.

As for the other explanatory variables that turned out to be statistically insignificant, expenditure per capita in households (X_{2jt}) includes both expenditure financed from labour income and from social transfers, but even more important is the reference to two statistically significant financial variables. If the activity of sports clubs is well financed from public funds (targeted grants X_{7jt} and general subsidy X_{8jt}) and the costs of participation individually borne by the exercisers are low, then the indicators referring to the income ability of households are not relevant for the popularity of exercise in sports clubs. Similarly, indicators linking economic and demographic issues, such as the percentage of working-age population (X_{3jt}) and the number of people in post-working age per 100 people in working age (X_{4jt}) are insignificant.

Conclusions

At the time of finalizing this article, the issue of economic and demographic determinants of the diversity of sports activity in individual provinces of the European Union state members constitutes a significant research gap. The research described in this article is only a suggestion from the authors of one of the possible approaches to this issue.

From the research carried out in this article on economic and demographic factors that may affect the popularity of practising sports in sports clubs in individual provinces of Poland, one can derive significant conclusions that can be useful for assessing the development of sports clubs in other countries.

The results obtained from the static panel model used based on data for all 16 Polish provinces covering the 2002-2018 time period indicate that the appropriate funding of their activities and infrastructure from public money is more important than the demographic and income characteristics of the inhabitants of individual provinces. Adequate financial support obtained from the state funds makes using sports clubs cheaper and more attractive for their users. On the one hand, this suggests that provincial governments should intensify their efforts to obtain more funds from targeted grants. They may also seek to adjust the mechanisms for calculating the general subsidy from the state budget to take greater account of the need to equalize opportunities for the development of sports activity in the provinces. However, this action seems to be more difficult and less effective. On the other hand, when assessing the development of sports activity in various parts of the country, the central government of the state should take into account the province's financial support mechanisms and improve them accordingly.

Specific and requiring deeper examination is the significant relationship between regional registered unemployment rates and the number of people exercising in sports clubs in individual provinces. The economic and psychological duality of potential reasons for such a connection outlined by the authors of the article deserves a deeper analysis, which would probably require the collection of data using an extensive survey method. Perhaps, this would allow to formulate proposals for actions to encourage the unemployed to become more active in sport.

These applications can be used by representatives of public authorities, especially at the local government level, as well as by authorities and active members of sports clubs, and not only from Poland. If it were possible to carry out research of this nature using regional data obtained from other countries, comparing the results from different countries could enrich and deepen the understanding of factors shaping the sport activity of the inhabitants of regions of different European Union countries and create the basis for formulating a proposal to reform sports activity support with EU funds.

A separate issue worth considering in the next study is to examine the impact of various economic and demographic factors on the geographical distribution of sports clubs and the density of their networks in individual parts of the country.

The above considerations lead to the conclusion that the most important for the development of organized physical activity of the society in Poland is the tendency of the province's community to exercise in sports clubs in conjunction with the activity of local authorities in raising funds to finance club activities and develop sports infrastructure.

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