WORKING PAPERS

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ECONOMIC DETERMINANTS OF SPORT PARTICIPATION IN POLAND

Economic determinants of sport participation in Poland

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Abstract

The article presents statistical description of economic factors that determine sport participation in Poland. Utilising data from 2008 Sport Participation Survey the biprobit model that takes into account the dependency between individuals and household attitude to sport participation is estimated. Sport participation is found to slightly decline with age of a person, on the other hand, education is found to be positively related to sport participation. The idiosyncratic factor of sport participation in Poland is the influence of children; they seem to encourage their relatives to partake in physical activity. Additionally, both the income level of a household and a personal income of a person have an influence on sport participation.

1. Introduction

The promotion of sport participation is now high on the public policy agenda. In recent years substantial funds were spent on building new sport facilities and improving the existing ones. The public engagement in sport is justified because considerable positive externalities of sport participation are widely expected, i.e. better health (Cawley, 2004), positive influence on educational achievements (Cornelisen and Pfeifer, 2007), labour market outcomes (Lechner, 2008), increased sociability (Downward and Riordan, 2007) or lower crime rate (Caruso, 2010). Much less is known about the economic incentives of engagement in physical activity and the relationship between economic indicators and sport participation.

In a scientific approach to sports, it is difficult to define sport. Particularly, there is no general agreement on which physical activities should be treated as sport and which as a recreation. According to the Council of Europe (1992), sport comprises all forms of physical activity which aim at expressing or improving physical fitness and mental well-being as well as forming social relationships or obtaining results in competitions at all levels. Therefore, recreation can also be considered as sport.

The purpose of this paper is to give an overview about the main socio-economic indicators of physical activity and sport expenditure. There is some interesting literature that has previously dealt with this topic. Several general tendencies are observed concerning economic determinants of sport activity. First of all, income plays a significant role with regards to sport participation. Hence, individuals with a higher income are more likely to participate in sports (Farrel and Shields, 2002, Humpreys and Ruseski, 2006). Secondly, it was shown that time used in caring for children or relatives impacts regular sport activity negatively (Breuer et al, 2010). In contrast, both school and work time had a positive effect on sport participation. Thirdly, a good educational background was found to have positive impact on sport participation (Humpreys and Ruseski, 2006). This can be explained by the fact that through a higher educational level, there may be a better understanding of the importance of physical activity and sport (Farrel and Shields, 2002).

The primary objective of this paper is to provide a comprehensive statistical investigation into sport participation phenomenon, which can quantify the relative importance of economic and demographic factors on the demand on sport activities in Poland. We use a large socio-economic dataset, a part of the Household Budget Survey (HBS) and additional data on sport participation. Specifically, we are interested in establishing the relative effect of characteristics such as age, education, place of living and income on the probability of participating in sport activities. Secondly, our intention is to deeply look at economic and social determinants of sport participation. We want to check whether the profile of a sport participant is similar to those found in other studies, or whether there are some idiosyncratic characteristics specific for Poland. Given the recent attention given to sport, the large improvement in sport infrastructure, and the fact that Poland is going to co-organise European Football Championships, we address the questions of whether or not low income acts as substantial barrier to playing sports, and whether there are regional differentials in sport participation in Poland.

We focus our analysis on eleven most popular sport activities in Poland. The novelty of our approach in comparison with the existing literature is the explicit control for the selection into sporting activity. We extend a traditional model of sport participation to include equation for the propensity of household to involve in sports, and therefore estimate biprobit model. This

allows us to model interrelated decisions regarding sport participation at both individual and household level. In this extended framework, we are able to confirm most previous findings from similar studies and shed some light on the issue of sport participation in Poland.

The paper is organised as follows. Section 2 presents a short overview of related literature, section 3 describes our data and highlights the incidence of sport participation in our sample. Our statistical framework for modelling sport participation and our hypotheses are discussed in section 4. The results of this analysis are presented in section 5, and section 6 concludes the text with a discussion of the results.

2. Literature overview

The literature concerning economic determinants of sport activity is rather limited. Among the few available works, Humpreys and Ruseski (2009, 2010) showed that economic factors like income and the opportunity cost of time are important determinants of physical activity and that physical activity itself should be treated as normal goods in the process of economic modelling. In their earlier study, Humpreys and Ruseski (2006) found that a higher income is associated with a higher probability of participating in physical activity. However, time spent in physical activity declines with an income. This means that the factors that lead to an increase in the likelihood of participating in sport generally decrease with the amount of time spent participating in sport. Similar conclusions are drawn by Breuer et al. (2010). They showed that spending on sport appears to be related to income meaning that with a rising income, sport expenditure goes up. That is, persons with higher income, and by this more financial potential, are able to spend more money on sport. Also, sport expenditure is lower among unskilled or semi-skilled workers in a comparison to managers or high-professionals. Furthermore, being employed is positively related to sport consumption, but negatively related to sport participation. This phenomenon can be explained by an income-leisure trade-off and the given time restriction (Downward and Riordan, 2007). Hence, a higher income is associated with more working hours and consequently, less leisure time. Beside that, their results showed that employed persons are slightly less likely to participate in sport than unemployed. This might also be explained by the fact that unemployed people have more leisure time available than working people and can thereby participate more often or for a longer period of time in physical activity. To the same results regarding employment status come Farrel and Shields (2002).

All these studies provide support for the greater impact of socioeconomic characteristics such as the form of employment and the level of education upon sport participation as opposed to work hours and household income which might be indicative of traditional substitution and income effects. Farrel and Shields (2002) and Downward and Riordan (2007) also particularly indicate the importance of gender and household factors such as the presence of children having effects on participation rates of particular sports. For example, they found that males tend to participate more than females in sports and declines in sport participation rates are associated with increasing age, being married, and the presence of children in the household. The latter is particularly the case for females. In addition, "lifestyles" factors such as drinking habits and self-reported better health tend to raise participation, while smoking reduces it.

Moving to demographic factors with regards to sport participation, Humpreys and Ruseski (2006) found that each additional year of age reduces the probability that an individual participates in sport by 0.3%. However, the probability of participation in physical activity

increases with educational level and further, females are less likely to participate in sport than males. Similarly, Farrel and Shields (2002) state that men are significantly more likely to participate in any kind of sport activity.

However, there has been only limited analysis of the economic and demographic factors that affect sport participation in Poland. A recent report by Central Statistical Office (2008) provides a descriptive analysis of sport participation in Poland. Sport participation was found to fall when a person's age and family commitments increase, as it is found in the other studies for different countries.

3. Dataset and descriptive analysis

In the fall of 2008 the Central Statistical Office carried out the study the "Participation of Poles in Sport and Recreation" which is our most important source of empirical data. The primary objective of the study was to find preferred ways of spending free time devoted to sport or physical recreation by members of households, to assess the degree of involvement of households and their members to participate in sport and recreational activity. Also, the average estimate of expenditures for this purpose was investigated, in an attempt to determine households' endowment in sports equipment and estimate the average expenditure in the last year for the purchase and maintenance of the sport equipment, as well as to participate in camps and sporting activities.

The "Participation of Poles in Sport and Recreation" study was performed as a module in the Household Budgets Survey on the subsample of 4704 households participating in the third quarter of 2008. 13605 respondents each filled the questionnaire by a direct interview method. They were asked questions about participation in over 30 specific sport and recreational activities and the purchase of sport equipment during the period from 01/10/2007 to 30/09/2008. This method of data collection allows us to use more information about the household, than those directly resulting from the module on sport and recreation.

The second source of empirical data, complementary to the first, is the Household Budgets Survey. It plays an important role in the analysis of standard of living. It is an essential source of information on revenues, expenditures, quantitative intakes of food and other aspects of living conditions of specific categories of the population. The Household Budgets Survey provides detailed information including: the demographic structure of households, the economic activity of individuals included in the sample household, and most importantly from the perspective of the analysis level and sources of revenue achieved and the level and structure of the spending, sources of acquisition of goods and services. The data derived from the Household Budgets Survey can be used to analyse the living conditions of the population, and to assess the impact of various factors on the development of the level and composition of the basic groups of living conditions of households. We add that information to the one gathered from the sports module. This step is particularly important, because it allows us to investigate the economic as well as the socio-demographic factors that impact sport participation.

The focus of the paper is placed on one's decision to participate in physical activity. We are interested in the analysis of those people who decide to do a sport and for that reason we have excluded all children under 16 as their sport activity decisions may be strongly influenced by their parents. Moreover, we also excluded the older persons who stay in full time education,

as they have compulsory physical education in their curricula and consequently have easier access to sporting facilities and infrastructure than the other adult members of the society.

The average sport participation rate in Europe is slightly over 40%, however, it tends to be lower in the Southern and higher in the Northern part of Europe (Gratton and Taylor 2000). Sport participation in Poland is generally lower in comparison to other European countries; only 30.6% respondents declared participation in at least one of 32 types of sporting activity during the last 4 weeks. However, the results detected a slight difference between males and females. In the former group 32.1% declare sport participation, while in the latter 29.9%. In what follows we are concentrating on the most popular sports in Poland. The three most popular sports in Poland are cycling (declared by 16.3% of population), jogging and walks (10.7%), swimming (10.4%). In the next group of interest are football (4.6%), volleyball (3.6%), gymnastics (3.1%), badminton (2.5%), skiing (2.3%), weight sports (2.3%), basketball (1.7%) and table tennis (1.6%). Participation rate in all but one remaining sport discipline does not exceed 1.5%. The exception is fishing declared by (1.9%) of the population, despite treating fishing as a pure recreational activity and not a sport. It must be noted that gymnastics includes fitness and weight sports includes body building. One additional remark on skating should be made as well. When we look at all respondents including children it turns out that skating is a quite popular sport, but performed mostly by teenagers.

The data shows substantial diversity in the sport disciplines that men and woman play. Figure 1 shows the percentage of men and women in the most popular disciplines. Men appear to prefer cycling, swimming, football and jogging while women prefer cycling, jogging, swimming and gymnastics. The biggest disparities in favour of men are observed in football, weight sports, table tennis and basketball. On the other hand, women dominate in other sports, namely in gymnastics, jogging and walks and badminton.

Figure 1. Sport participation by gender
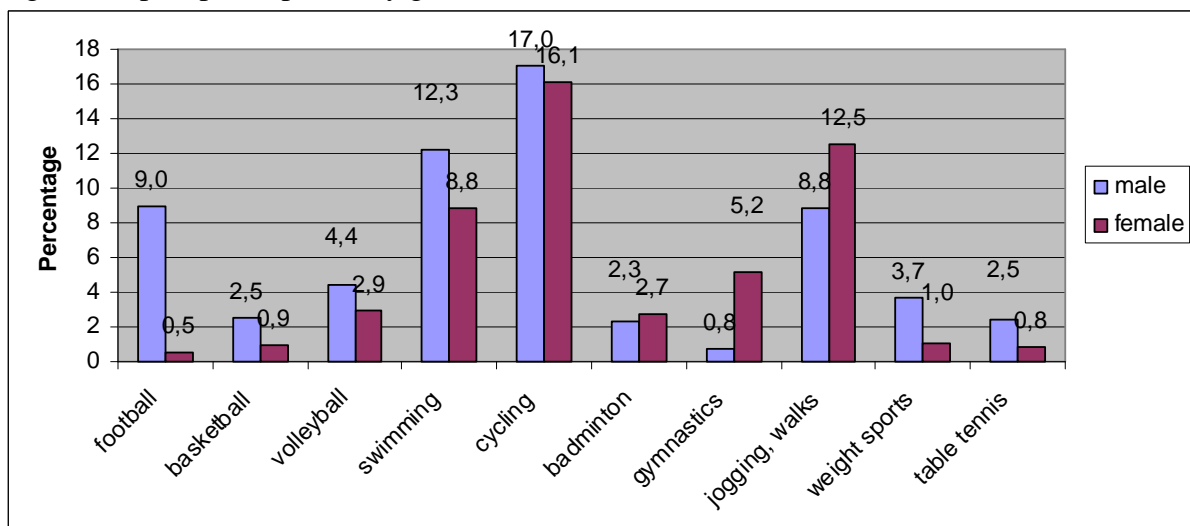
Table 1 presents the distribution of sport participation by important and commonly used economic research socio-demographic indicators. As it is expected and found in the other studies, age plays an important role in sport participation. Over 40% of persons under 30 do a sport, while for the oldest group (the over 50's) the number is halved. In sports good condition and fitness are required, the fall in the share of participant is much larger, for example in football, basketball, and weight sports. A very different trend is observed for

jogging and walks, where the actual fall in the participation rate is much smaller. This confirms the observation that the older people, if they decide to participate in sports, would rather choose less physically demanding ones. Education turns out to be an important determinant of sport participation. More than 50% of people with higher education at the university level participate in sport, while only just below 16% of those with the lowest education. This disparity is very similar regardless of the sport we analyse. This suggests that educated people have a better perception of benefits of good health and fitness.

Table 1. Participation in sports by key socio-demographic measures

sport activity	Distribution by age groups			Qualifications		Town size		Income quintile	
	age<30	age 30-50	age50+	unskilled	HE	big town	country	bottom	top
all sports	40,31%	33,15%	21,08%	15,91%	50,73%	37,18%	26,07%	20,14%	47,55%
football	10,93%	4,47%	0,52%	2,73%	5,79%	5,77%	4,51%	4,18%	6,19%
basketball	3,68%	1,73%	0,35%	0,57%	3,51%	3,13%	1,02%	0,57%	3,83%
volleyball	5,84%	4,57%	1,02%	0,93%	8,98%	6,74%	2,42%	1,99%	6,95%
swimming	17,51%	12,68%	3,10%	2,76%	24,88%	17,64%	5,75%	4,66%	21,22%
cycling	19,24%	19,66%	10,82%	8,28%	26,39%	18,56%	15,72%	11,29%	23,63%
skiing	3,00%	3,14%	0,71%	1,93%	9,44%	4,58%	2,03%	0,74%	7,01%
badminton	2,48%	4,03%	0,68%	0,37%	6,57%	5,25%	1,67%	1,45%	4,49%
gymnastics	3,99%	3,46%	2,03%	0,41%	9,39%	6,57%	1,20%	0,79%	8,47%
jogging, walks	10,50%	11,60%	9,77%	6,01%	17,62%	14,91%	8,28%	5,80%	19,62%
weight sports	6,66%	1,56%	0,45%	0,94%	5,26%	4,66%	1,04%	1,30%	5,10%
table tennis	1,88%	2,10%	0,81%	0,64%	4,53%	3,61%	1,13%	1,22%	3,14%
N	1882	3617	4372	2091	1402	1836	4681	708	1597

Source: Own calculation based on CSO data.

Two remaining axes analyse potential disparities and barriers in the access to sport. In general, people living in towns, in comparison with those that live in the countryside, have a greater possibility to play various sports and a better access to sport infrastructure. One can easily see that the participation gap between big towns over 100 thousands inhabitants and the countryside is quite substantial. In the former, over 37% of respondents declare sport participation, while in the latter group only 26%. The differences are observed in all groups of sporting activity, but the smallest are in a case of football and cycling. The reason for football is that, firstly football is a very popular sport in rural areas; secondly there are more free areas to build a football pitch. The popularity of cycling could be explained by bicycles being a common vehicle used in casual situations in the countryside, and for that reason quite a lot of people participate in bike riding.

Also an income gap causes a sport participation gap. Nearly 48% of members from the richest household play sports, while only just over 20% of the participants are observed among the poorest households. The biggest disparities are found in skiing and swimming and may be explained by the cost of sport, but for gymnastics or volleyball neither is sophisticated equipment needed, nor are those sports associated with a high cost of renting the sporting facility. Therefore, the mechanism of a link between household income and sport participation remains unclear and will be investigated later on in the econometric framework.

4. Empirical method and research questions

The economic framework of sport participation decisions assumes that individuals maximize their utility subject to existing constraints. The common tool to conduct such analysis is the

SLOTH model (Cawley, 2004). In this model of time use, the time available is decomposed into several components: time spent sleeping (S), time at leisure (L), time at paid work (occupation, O), time spent in transportation (T) and time spent at unpaid work (home production, H).

From the economic perspective, the decision to participate in physical activity is analogous to the labour supply decision well known from the labour economic (Humpreys and Ruseski, 2006). In this context individuals have an expected benefit from participating in physical activities and face a shadow cost of their leisure time that depends on wage and other economic factors. If the expected benefits of participating in physical activity exceed the shadow price of an individual's time, then the individual will participate in physical activity.

The decision of sport participation may be considered at two distinct levels, namely household level and individual level. Different households may have different economic and social situations, attach different value to free time and therefore show different attitude to sport. It is clear from empirical studies that, for example, members of households who take care of children or elderly people are less likely to participate in sport. Consequently, the decision of sport participation taken by an individual may be influenced by the attitude of the household to sport activity.

From the behavioural perspective the decision of sport participation also contains two stage processes. First, the individual decides whether to participate in physical exercises, or not. This decision is influenced by the economic situation of the household. Then, the individual chooses suitable sport discipline, which is adequate to the specific needs.

Our aim is to model individual decisions regarding sport participation using simple binary variables taking value of 1 if an individual participates in sports or particular type of sports and 0 if otherwise. This situation leads to setting up a probit model. Hence, for the above mentioned reasons, there could be present selection effect. An individual decides to participate if the expected benefits from sport participation exceed his cost of time at leisure. Additionally, we are aware of social interactions in the household that may have an influence on sport participation (see, Downward and Riordan, 2007). The other members' attitude to sport may increase or decrease the subjective value of time spent at physical activity. Therefore, we choose to set up a two-step bivariate probit model. The bivariate probit model can be thought as the appropriate method to examine the household choice to participate in sports and simultaneously, the individual's choice if it is conceivable that the sample of individuals undertaking different sports is not random. The main idea behind this model is that indirectly observed decisions are interrelated.

What follows is the full setup of the model is following. Let S^{*}_{ih} be a household's propensity to participate in sports, which is not directly observed. It is modelled as a function of exogenous household characteristics which have an influence on S.

$$S^{*}_{ih} = X'_{ih}\,\beta + \varepsilon_1 \tag{1}$$

The individual propensity to do a sport is also not directly observed, however the final effect is known to researcher. Let S^{*}_{ii} be an individual's propensity to sport participation. Analogously, it is modelled as a function of exogenous individual's characteristics.

$$S^{*}_{ii} = Z'_{ii}\,\gamma + \varepsilon_2 \tag{2}$$

and

$$S_{ii} = \begin{cases} 1 & if \quad S^*_{ii} > 0 \\ 0 & if \quad S^*_{ii} \leq 0 \end{cases} \tag{3}$$

Furthermore, we assume that $(\varepsilon_1, \varepsilon_2)$ are jointly normally distributed, with non-zero correlation. This implies that the household attitude to sport indirectly affects the decision of the individual and simultaneously the decision taken at the individual level has an impact on the household's propensity to sport.

We estimate a series of models for sport participation using the maximum likelihood method. Each consists of two interdependent equations, one for the household propensity to be involved in sport activity and the second for the individual's sport participation. The equation for sport propensity of the household is the same for all models. It describes household characteristics that affect sport participation. The element that allows to distinguish between models is the dependent variable of individual sport participation equation. We fit a general model of individual sport participation and additionally separate models for the most popular sporting activities performed in Poland. As for several households we have information on sport participation for more than one person, our observations in the sample are not independent. To remove the problem we account for that by the clustering of residuals.

The independent variables are divided into two distinct sets, one describing household's participation and the other individual's characteristics. They reflect resources and capabilities of the household that allow their members to do a sport and individual preferences. At the household level we control for the location of the household, a family structure and household income. At the individual level we look at basic characteristics such as age, gender, educational background, employment status and disability of a person.

The location of the household is described by two dummy variables for a town over 100 thousand inhabitants and a smaller town, with rural area as a reference category. As a result, Table 1 indicates, that the bigger the town the better access to sport facilities and hence higher sport participation level. The size and structure of the family also have an impact on propensity to participate in sports. In the model specification we include dummies for having family, having infants and having children. We also control the number of persons in the household. As it is shown by Farrell and Shields (2002) and Downward and Riordan (2007) we expect that the fact of being married and presence of infants or children's will all have negative effects on sport participation. Moreover, it can be expected that the impact of negative signal from the household will be stronger on women than men. Despite that, the size of the household and the number of children both has positive influence on sport participation probability according to Humphreys and Ruseski (2009).

As it is shown by Humphreys and Ruseski (2006) in their model of economic determinants of sport participation, a higher household income has a positive impact on sport participation as the households with more available financial resources are able to spend more on leisure. This stipulation is supported by Eisenberg and Okeke's (2009) work. They found that persons from lower socioeconomic groups show limited interest in sport activity. Furthermore, we expect that persons from richer households will be more likely to choose cost-intensive sports, for example skiing. We control income at the household level by inclusion of income quintile dummies.

In addition, at the household level we control inter-regional differences by the inclusion of sixteen dummies for voivodships. Despite that, we anticipate that differences. If they exist, are rather small and those variables should not be significant.

At the individual level where participation in a particular sport is decided we control for demographic and socio-economic attributes of the person. In harmony with the descriptive analysis presented in the previous section we expect that participation in sport and recreation will decline with the increasing age of a person. Moreover, similar results have been found in the literature. We also predict that major gender differences in propensity to participate in various sport disciplines will be found. As it is shown by Humphreys and Ruseski (2006) it is predicted that good educational background will also have a positive impact on sport participation decision in Poland. Additionally, we control personal income. In general, the household financial resources are a good determinant of sport participation. However, the member of household who brings more individual income has more power to make spending decisions. Therefore, we stipulate that the greater personal income, the greater probability of sport participation. The evidence in the literature for the impact of employment status on sport participation is mixed. On one hand, employment gives income and hence resources to spend on sport. But on the other, working decreases the time available for leisure. Nevertheless, we expect that in the case of Polish society the former effect is more important, and therefore we expect that employment will have a positive effect on sport participation, but for those who are self-employed the effect could be negative.

At the end of this section we mention variables that control health status. Two dummies, one for light and heavy disability are included in the model specification. We expect that both indicators will have a negative effect on sport participation, as physical abilities of disabled persons are limited. However, in certain circumstances disabled people may take sporting activity as a part of their rehabilitation process. For example, it could be that in the case of swimming or cycling, or other disciplines that help in rehabilitation the impact of disability will be positive.

5. Results

Before we move to analysis of the full model, let us concentrate on determinants of household participation in sport related activities. In table 2 we present estimates of sport participation probit equation, that is, equation (1). The dependent variable is a dummy which takes value 1 when at least one household member over 15 years is involved in sport activity. All independent variables have a discrete character. As a reference categories are chosen rural area for the size of town variables and the bottom income quintile for household income quintile dummies. To conserve space we do not report estimates for voivodship dummies.
The signs of the coefficients are in accord with our stipulations based on the literature, however not all effects are significant in a statistical sense. The bigger the town, the greater the probability of sport participation. However, the effect for medium sized towns is much weaker, about half the size of big towns. The probability of sport participation tends to rise with an income, but for the below average income quintile the effect is positive and significant. Quantitatively, the effect is the strongest for the top income quintile. The size of the effect for the second quintile from the top is a two third of the top income. This result suggests strong income disparity in the sport participation. Clearly, members of the richest households participate more often in sports.

Table 2. Determinants of household participation in sports

Household participation	Coefficients	Marginal effects
town over 500ths	0.212	0.072
	(3.39)**	(3.20)**
town	0.117	0.039
	(2.25)*	(2.20)*
below av. Income quintile	0.193	0.065
	(1.71)	(1.78)
average income quintile	0.306	0.107
	(2.69)**	(2.83)**
above av. income quintile	0.594	0.219
	(4.99)**	(5.35)**
top income quintile	0.880	0.332
	(7.29)**	(8.05)**
family	0.037	0.012
	(0.76)	(0.75)
# of person in household	0.280	0.089
	(12.33)**	(8.41)**
children 0-3 years	-0.258	-0.075
	(2.91)**	(3.04)**
children 4-15 years	0.410	0.146
	(6.08)**	(5.56)**
Constant	-1.228	
	(8.40)**	
Observations	3727	3727
Pseudo R^2	0.119	

Absolute value of z statistics in parentheses

* significant at 5%; ** significant at 1%

Source: Own calculation based on CSO data.

Contrary with the results found in the literature, neither having family nor children in the household do not decrease the probability of sport participation. To be precise, there is no family effect. Apart from that, we observe the importance of the size of the family. Adults with bigger families have increased probability of sport participation by 9 percentage points. Also the presence of children in the family tends to increase the probability of sport participation. The effect of the infant is strong, moderately sized (7 percentage points) and negatively correlated with sport participation while for the older children the effect is positive and quite strong, near 15 percentage points, and strongly significant. This suggests that children have a positive influence on the parents with respect to sport participation.

Let's move to results from biprobit models for participation in different sport disciplines. On the top part of each panel in Table 3, estimates of the influence of individual characteristics are presented, with marginal effects in ME column, while in the bottom part the impact of factors that determine household participation in sport.

The household part of the model is common for all sport disciplines, and for that reason, the results are quite similar across all models. The small differences in estimates results from a different degree of dependency between an individual and a household factor for different sports.

The selection process is significant only in a case of jogging & walks and badminton at 1% level, volleyball and swimming at 5% level and in a model of participation in any discipline,

at 1% level. These results suggest that people who choose to perform the afore mentioned sports and to be involved in sport activity in general are influenced by the household attitude to sport activity. The jogging & walks and swimming, 3rd and 2nd most popular sports in Poland respectively, are typical sports that people in Poland do to stay fit. Badminton and volleyball are popular leisure sports usually performed in the summer time.

Now we discuss the determinants of the household involvement in sports one-by-one. The reference household is a rural household, from the bottom income quintile, with no children under 16 years. The quantitative effects of the biprobit model cannot be directly evaluated; hence we calculated marginal effects (ME) determined at zero values for discrete variables and at the mean values for continuous ones. All the considered households' characteristics appear to have an influence on sport participation across all disciplines. The effect of an income is particularly strong in case of swimming, cycling and skiing and has a moderate size, especially in top income quintiles, for jogging & walks and weight sports. The presence of strong income dependency in the case of swimming and cycling accords with our expectations that in order do those sport disciplines, sophisticated facilities are needed. Cycling appears on the list rather unexpectedly; however the cost of a semi-professional bicycle is equal to the average monthly salary, whilst a professional bicycle has a cost similar to a new car. Usually, members of richer families use more valuable sport equipment and that observation may explain strong income effect present in cycling.

The results for presence of children in a household differ completely from the one for the United Kingdom. It seems that the presence of infants decreases the probability of sport participation, while children increase the probability of sport participation in all analysed disciplines. However, the effect of infants do not exceed two percentage points while the positive impact of having older children is up to 4 percentage points.

What is important from the policy point of view is the size of the town of residence has an impact on sport participation. In general, members of households located in larger towns have slightly higher probability, around 2 percentage points, of sport participation, which suggests that there are differences in access to sport facilities between large towns and rural areas. The difference between smaller towns and rural areas in around 1 percentage point and significant only at a 10% level, therefore is much weaker. A different picture arises for cycling in that it is more popular in rural areas.

The evidence about regional differences is not very strong. The voivodship dummies are jointly important but not necessarily separately significant in each model. Despite that, there is weak evidence that the probability of sport participation is slightly higher in richer voivodships and those located in the western part of Poland, and slightly lower in the eastern part.

Table 3. Determinants of sport disciplines participation. Biprobit framework.

	all			football			basketball		
	coeff	t-stat	ME	coeff	t-stat	ME	coeff	t-stat	ME
age	-0,01	-7,42	0,00	-0,04	-13,94	-0,01	-0,03	-7,60	0,00
woman	-0,10	-3,65	-0,04	-1,47	-14,16	-0,09	-0,53	-6,12	-0,03
secondary	-0,36	-6,55	-0,14	-0,01	-0,09	0,00	-0,23	-2,34	-0,02
vocational	-0,65	-9,48	-0,25	-0,20	-2,04	-0,03	-0,41	-3,40	-0,03
primary	-0,82	-9,85	-0,30	-0,17	-1,23	-0,03	-0,49	-2,96	-0,03
personal income	0,01	1,06	0,00	0,00	1,05	0,00	0,00	0,47	0,00
heavy disability	-0,21	-3,10	-0,08	-0,04	-0,19	-0,01	0,10	0,46	0,01
light disability	-0,15	-2,08	-0,06	-0,68	-2,05	-0,07	-0,46	-1,20	-0,03
unemployed	0,47	2,93	0,17	0,51	2,09	0,12	-0,20	-0,44	-0,02
inactive	0,23	4,47	0,09	-0,03	-0,20	0,00	0,01	0,09	0,00
self-employed	0,06	1,23	0,02	-0,23	-2,27	-0,03	-0,24	-1,63	-0,02
constant	0,60	4,92		0,72	4,26		-0,20	-1,02	
town over 100ths	0,22	4,03	0,02	0,20	3,39	0,01	0,20	3,37	0,01
town under 100ths	0,10	2,22	0,00	0,09	1,84	0,00	0,09	1,83	0,00
below av. income quintile	0,18	1,93	0,07	0,20	2,05	0,01	0,20	2,06	0,00
average income quintile	0,30	3,06	0,12	0,37	3,52	0,02	0,37	3,53	0,01
above av. income quintile	0,56	5,15	0,18	0,66	5,89	0,03	0,66	5,90	0,02
top income quintile	0,76	6,31	0,24	0,92	7,81	0,04	0,92	7,83	0,02
family	0,13	4,06	0,03	0,12	3,23	-0,01	0,12	3,22	0,00
number of persons	0,23	10,79	0,03	0,20	8,36	0,00	0,19	8,38	0,00
children 0-3 years	-0,36	-5,10	0,01	-0,29	-3,80	0,00	-0,29	-3,77	0,00
children 4-15 years	0,47	8,36	0,04	0,50	8,54	0,02	0,50	8,59	0,00
rho	0,74	6,45		0,06	0,46		0,02	0,10	

Source: Own calculation based on CSO data.

	volleyball			swimming			cycling		
	coeff	t-stat	ME	coeff	t-stat	ME	coeff	t-stat	ME
age	-0,02	-6,78	0,00	-0,03	-11,79	-0,01	-0,01	-3,65	0,00
woman	-0,24	-4,38	-0,04	-0,22	-5,46	-0,08	-0,03	-0,91	-0,01
secondary	-0,34	-4,58	-0,06	-0,46	-7,65	-0,15	-0,14	-2,47	-0,05
vocational	-0,67	-7,06	-0,09	-0,92	-12,62	-0,25	-0,30	-4,94	-0,10
primary	-0,79	-5,94	-0,10	-1,15	-10,73	-0,28	-0,46	-6,00	-0,14
personal income	0,00	0,49	0,00	0,03	2,48	0,01	0,00	-0,86	0,00
heavy disability	-0,07	-0,44	-0,02	-0,39	-2,71	-0,13	-0,22	-2,41	-0,07
light disability	-0,26	-1,19	-0,05	-0,04	-0,32	-0,01	-0,10	-1,06	-0,03
unemployed	0,05	0,15	0,01	-0,02	-0,08	-0,01	0,50	2,72	0,19
inactive	-0,06	-0,59	-0,01	0,04	0,46	0,01	-0,03	-0,56	-0,01
self-employed	-0,03	-0,32	-0,01	0,08	1,11	0,03	0,06	1,01	0,02
constant	-0,24	-1,58		0,76	5,69		-0,22	-2,15	
town over 100ths	0,21	3,38	0,03	0,21	3,34	0,05	0,24	3,90	-0,03
town under 100ths	0,09	1,84	0,01	0,09	1,81	0,03	0,11	2,23	-0,02
below av. income quintile	0,20	2,06	0,01	0,20	2,06	0,02	0,19	1,90	0,04
average income quintile	0,37	3,53	0,01	0,37	3,53	0,04	0,34	3,28	0,07
above av. income quintile	0,66	5,90	0,03	0,66	5,89	0,08	0,62	5,54	0,10
top income quintile	0,92	7,83	0,02	0,92	7,81	0,10	0,89	7,45	0,11
family	0,12	3,22	0,00	0,12	3,22	0,00	0,11	3,22	0,02
number of persons	0,19	8,34	0,00	0,19	8,07	0,00	0,21	8,80	0,00
children 0-3 years	-0,29	-3,80	-0,01	-0,29	-3,78	0,00	-0,30	-3,92	-0,02
children 4-15 years	0,50	8,59	0,02	0,50	8,48	0,04	0,49	8,33	0,04
rho	0,22	1,64		0,23	1,84		0,35	3,26	

Source: Own calculation based on CSO data.

Table 3. Determinants of sport disciplines participation. Biprobit framework (continued).

	skiing			badminton			gymnastic		
	coeff	t-stat	ME	coeff	t-stat	ME	coeff	t-stat	ME
age	-0,01	-4,23	0,00	-0,01	-4,51	0,00	0,00	0,74	0,00
woman	-0,31	-5,52	-0,05	0,06	1,07	0,01	0,78	11,31	0,13
secondary	-0,74	-8,26	-0,10	-0,31	-3,55	-0,05	-0,40	-5,39	-0,02
vocational	-1,14	-9,97	-0,12	-0,49	-4,90	-0,07	-0,78	-8,34	-0,03
primary	-1,27	-6,93	-0,12	-1,00	-5,11	-0,10	-1,24	-7,76	-0,04
personal income	0,03	3,01	0,01	0,01	2,12	0,00	0,00	0,41	0,00
heavy disability	-0,39	-1,47	-0,06	-0,02	-0,12	0,00	0,06	0,44	0,01
light disability	0,10	0,50	0,02	-0,03	-0,13	0,00	0,22	1,41	0,02
unemployed	0,19	0,55	0,04	0,20	0,71	0,04	-0,20	-0,59	-0,01
inactive	0,07	0,57	0,01	-0,21	-1,65	-0,03	0,02	0,17	0,00
self-employed	0,30	2,80	0,07	-0,08	-0,75	-0,01	0,17	1,68	0,02
constant	-0,55	-2,84		-0,62	-3,72		-1,86	-13,29	
town over 100ths	0,21	3,41	0,01	0,21	3,52	0,02	0,20	3,24	0,00
town under 100ths	0,09	1,85	-0,01	0,09	1,76	0,00	0,09	1,78	0,00
below av. income quintile	0,20	2,06	0,01	0,20	2,03	0,00	0,20	2,04	0,00
average income quintile	0,37	3,53	0,03	0,37	3,55	0,01	0,36	3,51	0,01
above av. income quintile	0,66	5,89	0,06	0,66	5,91	0,01	0,65	5,84	0,01
top income quintile	0,92	7,81	0,09	0,91	7,75	0,00	0,91	7,69	0,02
family	0,11	3,21	0,01	0,12	3,30	0,02	0,12	3,26	0,00
number of persons	0,19	8,35	0,01	0,19	8,27	0,00	0,20	8,43	0,00
children 0-3 years	-0,29	-3,81	0,00	-0,30	-3,90	-0,02	-0,29	-3,81	0,00
children 4-15 years	0,50	8,54	0,04	0,50	8,72	0,03	0,50	8,51	0,00
rho	0,06	0,31		0,42	3,08		0,23	1,52	

Source: Own calculation based on CSO data.

	jogging&walks			weight sports			table tennis		
	coeff	t-stat	ME	coeff	t-stat	ME	coeff	t-stat	ME
age	0,00	1,85	0,00	-0,03	-7,35	0,00	-0,01	-1,97	0,00
woman	0,18	5,42	0,05	-0,57	-6,88	-0,04	-0,45	-6,59	-0,05
secondary	-0,19	-3,07	-0,05	-0,35	-3,85	-0,03	-0,39	-4,00	-0,05
vocational	-0,33	-4,69	-0,08	-0,68	-6,18	-0,05	-0,73	-6,29	-0,07
primary	-0,57	-6,43	-0,12	-0,73	-4,20	-0,05	-0,79	-4,63	-0,07
personal income	0,01	1,08	0,00	0,00	-0,12	0,00	0,00	1,02	0,00
heavy disability	-0,12	-1,28	-0,03	0,20	0,83	0,03	-0,07	-0,34	-0,01
light disability	-0,17	-1,64	-0,04	0,01	0,05	0,00	0,16	0,87	0,03
unemployed	0,36	1,79	0,11	-0,18	-0,38	-0,02	-0,06	-0,13	-0,01
inactive	0,31	4,54	0,10	-0,06	-0,34	-0,01	-0,12	-0,82	-0,02
self-employed	0,01	0,22	0,00	-0,06	-0,51	-0,01	0,09	0,82	0,02
constant	-1,03	-7,70		-0,05	-0,23		-1,01	-5,51	
Town over 100ths	0,20	3,31	0,02	0,20	3,25	0,04	0,20	3,38	0,03
town under 100ths	0,09	1,78	0,01	0,09	1,81	0,02	0,09	1,84	-0,01
below av. income quintile	0,21	2,07	0,02	0,20	2,06	0,00	0,20	2,06	0,00
average income quintile	0,37	3,53	0,03	0,36	3,51	0,02	0,37	3,52	0,03
above av. income quintile	0,66	5,95	0,03	0,66	5,90	0,02	0,66	5,90	0,03
top income quintile	0,92	7,80	0,06	0,92	7,76	0,05	0,92	7,83	0,03
family	0,11	3,09	0,03	0,12	3,26	0,01	0,12	3,23	-0,01
number of persons	0,20	8,22	0,00	0,19	8,39	0,00	0,19	8,37	0,00
children 0-3 years	-0,31	-3,91	0,02	-0,29	-3,81	0,01	-0,29	-3,80	-0,01
children 4-15 years	0,50	8,66	0,00	0,50	8,61	0,00	0,50	8,53	0,04
rho	0,33	2,24		0,14	0,86		0,05	0,27	

Source: Own calculation based on CSO data.

At the individual level, the estimates generally accord with our presumptions. Age has a negative effect on sport participation; however the quantitative effect is almost zero for each discipline. In addition, it seems that age has no impact on participation in jogging & walks and gymnastics, that is, in sport disciplines that help to maintain shape. We have also tried to estimate models with square and cubic polynomial for age, but higher order terms were not statistically significant. Therefore, we conclude that our results are robust to the model specification. In all but two disciplines, namely cycling and badminton, the gender gap is present. Only in cases of gymnastics (13 percentage points) and jogging & walks (5 percentage points) does being a woman increase the probability of sport participation. The biggest differences in favour of men are observed in football (9 percentage points) and swimming (8 percentage points). Education has a very strong and positive effect on sport participation as it was predicted. For all disciplines, the secondary educated persons have a lower probability of 16 percentage points to participate than those who have achieved tertiary level of education. For persons with a vocational level of education the probability gap is almost two times wider with 31 percentage points. Looking at each sport discipline separately, quantitatively the strongest impact of education is noted for swimming. On the other hand, football is the only discipline where education does not affect participation levels at all.

After controlling household income at the household level, personal income has no great influence on sport participation. However, in a case of several disciplines the effect is present. Again, the effect of personal income is important for rather costly sports, such as swimming and skiing. Also the effect is statistically significant for badminton, but quantitatively, it is almost zero. In all cases the greater personal income, the greater probability of sport participation.

In labour market status, the reference category is a fully employed person. When we concentrate on general participation in sport, a person's status of unemployed or inactive increases the likelihood of sport participation. This suggests that in relatively poor societies people face difficulties in choosing between work and leisure time. Those who work do not have much time for leisure related activities. When we analyse sport disciplines one-by-one the evidence is much weaker. Only in the case of football, cycling and jogging & walks do those who do not work have increased probability of sport participation. Additionally, we found that self-employment positively impacts participation in skiing. We do not observe this effect for less income-demanding sports and this result implies that a money barrier exists to do a particular sport.

Last, but not least, we control the disability of a person in our models. The results with respect to that factor are also not fully convincing. In a model for all sports, heavily disabled persons are less likely to engage in sporting activity. The effect is also present in a case of swimming and cycling. The negative influence of light disability was observed in the case of football only. This may be a purely statistical issue and be related to the general low rate of participation in several disciplines. A few disabled people among a few sport participants may account for a similar share.

Finally, we investigate the possible dependency between household incomes per person and participation ratios in different sports disciplines. The correlation coefficient (rho) is not significant in all models of sport participation in various disciplines, which suggests that there is no direct relationship between household and individual sport participation. Therefore, we looked at the household income per person and divided income scale to 200 intervals with 25 PLN widths (approximately 6.50 euro). Then we estimated a series of probit models for

participation in sport disciplines in which we used all variables discussed in the biprobit model and then calculated the probability of sport participation for each sport discipline and income interval separately. Figure 1 presents our main findings.

Figure 2. Sport participation probability
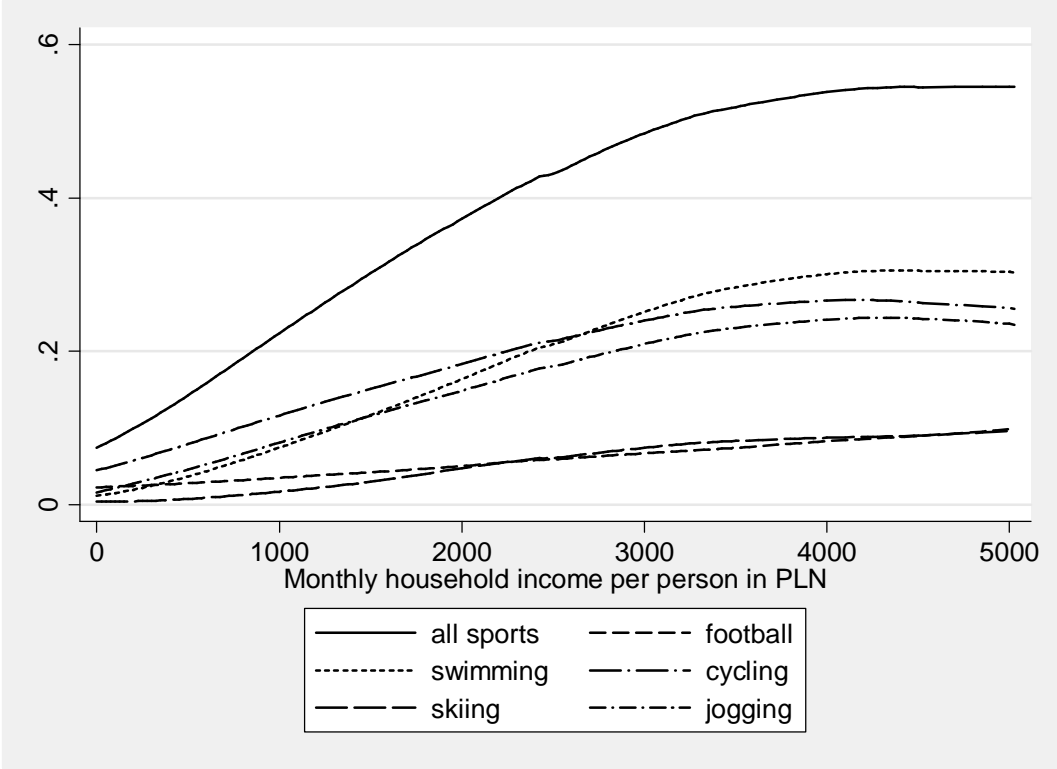
Source: Own calculation based on CSO data.

In general, one can easily notice that there is a positive association between household income per person and sport participation rate. The higher the income, the higher the sport participation. Moreover, we can divide sport disciplines into two groups: the first is income sensitive and in the other, the participation rate is only moderately is affected by the income level. In the former group, there is swimming, cycling, jogging and gymnastics. The income-participation profiles for the first three disciplines are presented in Figure 1. All mentioned profiles are very similar, sport participation rate rises linearly up to an income level of 3500 PLN (approximately 825 euro which is slightly above the average wage) and then the participation rate becomes constant or even declines. This suggests that when the household have such income that sport consumption is no barrier to different spending, then a certain amount is dedicated to sport. The households with income below the average, face a tighter budget constraint and we see that the sum dedicated to sport is rather a constant share of income than a lump sum. In the latter group, one can find ball sports (football, basketball and volleyball), skiing, badminton and weight sports. The difference in the participation rate between the low income and the high income households is not big, and the point in which the line starts to be parallel to the income axis is far on the left from that of income sensitive disciplines. This means that for those disciplines if income plays any role in determination of sport participation rate, it is only important for especially poor households. These results suggest that the best way to increase sport participation rates is to increase income of poorer household or provide subsidised access for their members to sport facilities.

6. Conclusions

In this paper we have provided a detailed statistical analysis of the economic and demographic factors that determine sport participation in Poland. We have used the Household Budget Survey data and an additional module on sport participation which contains a lot of relevant information. In particular, we were interested in establishing a role of such factors as socio-demographic characteristics of sport participation as well as economic ones. We developed a model regarding social and economic determinants influencing sport participation and physical activity. In our framework, we consider two related decisions. The first is whether to participate in sport and the second is which sport discipline to participate in. Our modelling approach allows controlling for both household and individual attitude to sport participation. The set of control variables included several factors repeatedly documented as associated with sport participation in the sport economic and the physical activity literature.

Sport participation is found to slightly decline with age of a person in almost all sport disciplines. The exception from that rule is found for gymnastics and jogging & walks. The gender differences which are present in other studies are not significant in Poland, however there are some noticeable differences between men and woman regarding particular sport disciplines. Men choose cycling, swimming, football and jogging while woman choose cycling, jogging, swimming and gymnastics. Males have a significantly higher participation rate in football, weight sports and basketball, whereas the opposite is true for gymnastics, jogging & walks and badminton.

With respect to the influence of education on sport participation, Poland is very similar to other countries. Education is found to be positively related to sport participation. The idiosyncratic factor of sport participation in Poland is the influence of children. While in many European countries they decrease the likelihood of sport participation, in Poland they seem to encourage their relatives to partake in physical activity.

What is important from the policy point of view is that, both the income level of a household and a personal income of a person has an influence on sport participation. Low income households participate to a lesser extent in sport than high income households. For instance, having an income in the top quintile increases the probability of participating in sport by 24 percentage points relative to those households from the bottom income quintile.

The detailed analysis of the relationship between household income per person and the probability of sport participation showed that in the low income household, sport spending highly depends on income while in the high income household, a lump sum would rather be designated. During this analysis of income sensitive sports, we found that the income level at which the sport participation rate is not dependent on income is well above the average income. These results suggest simple solutions for policymakers. If their aim is to increase the sport participation ratio then the cost of access to the sport infrastructure should be subsidised.

In terms of policy prescriptions, our analysis provides evidence that income plays an important role in determining sport participation in Poland. Moreover, the place of living is also important factor as members of households located in larger towns have a slightly higher probability of sport participation. Unfortunately, this two effects work in the same direction, usually rural households are poorer than town ones. These results suggest that there are differences in access to sport facilities between large towns and rural areas. This provides

some support for government policies to bring sporting infrastructure to every local community, especially rural ones.

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