ROUTLEDGE HANDBOOK OF SPORT MANAGEMENT

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ROUTLEDGE HANDBOOK OF SPORT MANAGEMENT

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ratings of player performance, the extent to which remaining years on a contract affect salaries, a better understanding of the duration of contracts, and the voluntary versus involuntary duration of player careers.

The final chapter of this section examines sport events. In this chapter Gratton charts the historically varying economic rationales for why government (public sector) expenditure on sport has expanded considerably. For example, a transitional emphasis from social welfare to economic regeneration of cities occurred in the UK following rises in unemployment and de-industrialization. The chapter reviews the theory and evidence associated with the potential benefits of hosting major sport events, with a particular focus on the Summer Olympics, and concludes by examining the likelihood of longer-term benefits or legacies being derived from investment in hosting sport events. The chapter concludes by arguing that most evidence relates to the immediate economic impact during and immediately after the event has been held. However, there is a need for research to concentrate on the longer term urban regeneration benefits that sport has the potential to deliver.

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THE ECONOMIC ANALYSIS OF SPORT PARTICIPATION

Paul Downward, Fernando Lera-López and Simona Rasciute

Introduction

The 1992 European Sport Charter argues that

> Sport embraces much more than traditional team games and competition. Sport means all forms of physical activity which, through casual or organized participation, aim at expressing or improving physical fitness and mental well-being, forming social relationships or obtaining results in competition in all levels.

As indicated by Downward et al. (2009), however, there are a wide variety of specific activities that can be described as sport, then monitored and promoted as such by public authorities. In this respect, as Gratton and Taylor (2000: 7) note, definitions of sport involve "the criterion of general acceptance that an activity is sporting, e.g. by the media and sport agencies." Recognizing this potential for diversity, between the 1960s and the 1990s there was a significant increase in the number of people taking part in sport and in the frequency of sport participation in Europe (Gratton and Taylor, 2000). In Europe, the "Sport for All" campaign aimed at providing sporting opportunities for the general population. Many European countries developed sport policy programs which aimed to increase levels of mass participation in sport and physical activity (Green and Collins, 2008). Major public investment in new indoor sport facilities led to a striking increase in opportunities for sport (Gratton and Taylor, 1991).

Nevertheless, since the turn of the century, sport participation appears to have reached a stagnation point in many European countries (e.g. Spain, Finland, Belgium, Portugal and Austria), and has actually begun to decline in some countries such as the Netherlands, Italy and England (van Bottenburg, 2005). In England, for instance, sport participation fell from 48 percent in 1990 to 46 percent in 1996, with a further drop to 43 percent by 2002 (Rowe, Adams and Beasley, 2004). In Spain, where traditionally sport participation rates have been below the European average, sport participation seems to have reached a stagnation point. Over the period from 1995 to 2005, sport participation increased by only 1 percent (García Ferrando, 2006).

This decline has not only taken place in European countries, but also in other areas of the world. Sport participation figures for the adult population in Canada, for example, show a

decrease from 45 percent to 31 percent between 1992 and 2004 (Bloom, Grant and Watt, 2005). In the United States also, sport participation has either decreased or has grown at a slower rate than the overall population over the past decade (SGMA, 2004).

This decline is of considerable concern for health and social policy. At the same time, surveys show a dramatic increase in the incidence of being overweight and obese in developed societies. There is a large body of scientific evidence regarding the positive impact of sport and physical activity on health and well-being (Scully et al., 1999; Sila, 2003; Biddle and Ekkekakis, 2005; Biddle et al., 2004; Kara et al., 2005; Lafont et al., 2007; Miles, 2007). Contributions are also growing in economics (Rasciute and Downward, 2010; Downward and Rasciute, 2011). Finally, there is also a range of evidence debating the value of sport to other important areas of social policy such as education, community regeneration, community safety (e.g. preventing juvenile crime) and the environment.

Consequently, the negative evolution of sport participation in the last ten years, coupled with evidence of sport's health and social impacts, has resulted in a strong increase in academic interest in sport participation research, although there has been only limited analysis of the economic theories of sport participation (e.g. Downward, 2007; Downward et al., 2009; Gratton and Taylor, 2000; Humphreys and Ruseski, 2007, 2010).

The aim of this chapter is to provide an introduction to this theoretical and empirical literature and also to provide an empirical example by analyzing the determinants of sport participation in Spain. The remainder of the chapter proceeds as follows. The first section reviews the theoretical approaches and the empirical evidence concerning the key determinants of sport participation. This is followed by a description of the data set and the methodology adopted in the study and then a presentation of the main estimation results. The chapter concludes with a summary of the main findings and an indication of the policy implications and opportunities for further research.

Literature review

Theoretical motivation

The theoretical motivation for the economic analysis of sport participation arises from a variety of perspectives (Downward et al., 2009; Downward, 2007; and Downward and Riordan, 2007). For example, a "heterodox" approach draws upon Scitovsky (1976) and Earl (1986, 1983) to explore the psychological underpinnings of consumer choice in lifestyles, emphasizing learning by doing and habits and, as a consequence, maintaining that the preferences of economic agents are endogenous. Post-Keynesian consumer analysis (see, for example, Lavoie, 1994) also draws upon these concepts and combines these with insights from the studies of leisure by Veblen (1925) and Galbraith (1958) and, by implication, the sociological work of Bourdieu (1984, 1988, 1991) to show that preferences and consequent behavior will then be shaped by social values and that sport participation is likely to be linked to income differentials.

In contrast, neoclassical economics has three main theoretical approaches which share the view that preferences are given and fixed to the sport participant. The first approach, which was employed in early US studies such as Adams et al. (1966), applies basic economic consumer demand theory to examine participation, treating sport participation as a commodity demand. An alternative approach is the "income–leisure trade-off" model of labor supply, in which sport is viewed as the consumption of time as discussed by Gratton and Taylor (2000). More recently Wicker, Breuer and Pawlowski (2009), Breuer and Wicker (2008), Downward

(2007), Downward and Riordan (2007), Breuer (2006) and Humphreys and Ruseski (2006) have argued that a more comprehensive foundation for the analysis of sport participation can be constructed with reference to Becker (1965, 1974). In this respect, the participation decision can be understood as an individual choice to commit goods and time to the "production" and then consumption of sport directly, or to the acquisition of personal consumption capital, or social capital that then underpins sport participation. An important feature of this analysis is that it emphasizes that goods and time can be allocated across other activities as well as just sport.

All of these theoretical approaches share common elements. They would predict that prior experience in sport activities is likely to raise participation in any specific activity, and that social interactions, or lifestyles, will also affect participation along with access to income. However, it is equally clear that the explanations for the predictions do differ. In this chapter, no attempt is made to discriminate between the accounts, a task which, it has been argued, is difficult due to data availability and identification issues (Downward, 2007). In contrast, the empirical work that follows seeks to exemplify the literature, which is reviewed next, noting these broad shared insights.

Empirical evidence of the determinants in sport participation

The empirical analysis of sport participation in economics has proceeded by the application of various regression techniques in which measures of sport participation are conditioned on a variety of covariates.[1] In broad terms, the first empirical studies dealing with leisure and sport participation, and considering a wide range of activities, were undertaken in the US. Adams et al. (1966) explored participation in swimming, fishing and boating in the Delaware Estuary. Cicchetti et al. (1969) employed a two-step econometric model to look at decisions to participate as well as their frequency in the US. At the European level, the first evidence was provided by Rodgers (1977). It showed substantial similarities in the pattern of sport participation across different European countries. Later analyses of sport participation in Europe show significant geographical and social differences in European countries, with low rates in South and East European countries on the one hand, and among women, elderly people and individuals living in rural areas and with a lower educational level, on the other hand (Van Tuyckom and Scheerder, 2010). Differences seem to be greater in terms of gender and age (Hovemann and Wicker, 2009; Van Tuyckom et al., 2010).

Over this period the modeling of sport participation decisions has increased in complexity. Rather than applying ordinary least squares, even to binary data measuring participation or not, logistic (Downward, 2007; Hovemann and Wicker, 2009; Van Tuyckom and Scheerder, 2010; Van Tuyckom et al., 2010) and two-step Heckman models as well as multiple classification analysis (Breuer and Wicker, 2008; Downward and Riordan, 2007; Eberth and Smith, 2010; Farrell and Shields, 2002; Humphreys and Ruseski, 2006, 2007; Stratton et al., 2005), and double-hurdle models (Humphreys and Ruseski, 2010) are employed. Logistic regression studies examine the incidence of participation (yes *or* no) for any given activity, or set of activities as an explicitly binary variable.[2] Heckman and Hurdle models employ a further estimate of the frequency of participation. The modeling assumption is that different decisions govern the choice to participate and the frequency of participation in sport. There are differences in interpretation between the models. Essentially the hurdle model treats "zero" values of the frequency of participation as a genuine choice.[3] In Heckman models, the assumption is that the potential to participate is not fully observed because of the participation decision. In this model, therefore, account is taken of any "selection bias" in observing participation frequencies.

Before reviewing the evidence in detail notes of caution should be offered. Firstly, whilst the generic references above are to sport, as noted earlier, it should be remembered that the list of sporting activities varies from one study to another. Secondly, as also noted above, the sport participation variable is measured in different ways. Indeed, relatively few studies consider the time spent on sport participation or the frequency of such participation (e.g. Downward and Riordan, 2007; Eberth and Smith, 2010; García et al., 2010; Humphreys and Ruseski, 2007, 2010; Lera-López and Rapún-Gárate, 2007). Thirdly, the comparability of estimates produced from different statistical approaches may be difficult in both sign and magnitude.[4] Finally, it has been emphasized in different European studies that there are peculiarities about the determinants of sport participation in different European countries (Hovemann and Wicker, 2009; Van Tuyckom and Scheerder, 2010; Van Tuyckom et al., 2010). This suggests the potential for cross-country differences in behavior. Bearing in mind these caveats, it is possible to make some qualitative general assessments concerning the role played by economic, individual and social variables on sport participation. Table 25.1 presents a summary.

Examination of this table reveals that the probability of sport participation decreases with age (Barber and Havitz, 2001; Breuer and Wicker, 2008; Downward, 2007; Downward and Riordan, 2007; Downward and Rasciute, 2011; Eberth and Smith, 2010; Farrell and Shields, 2002; Fridberg, 2010; Hovemann and Wicker, 2009; Humphreys and Ruseski, 2006; Moens and Scheerder, 2004; Scheerder et al., 2005a; Stratton et al., 2005; Wicker et al., 2009). Such differences in sport participation can be attributed to biological and physical limitations and, consequently, to changes in the types of activities preferred by the older age groups (Barber and Havitz, 2001) and it seems to affect males more than females (Bauman et al., 2009). García et al. (2010) report that for Spain sport participation follows a U-shaped curve with two peaks: youth and retirement.

The empirical evidence focusing on sport participation frequency has found a positive relationship between the two variables (García et al., 2010; Humphreys and Ruseski, 2006; Lera-López and Rapún-Gárate, 2007). This could be due to people using sport as a health precaution and because there is a higher level of health awareness among older people. In addition, target-group-specific offers to involve older adults in sport activities seem to be effective (Breuer and Wicker, 2008). In a longitudinal perspective, Stamatakis and Chaudhury (2008) report that trends in adults' sport participation in England between 1997 and 2006 show that sport rates have increased among middle-aged and older adults and have decreased among young men. Nevertheless, there is also empirical evidence that shows that time spent in sport tends to decline with age in Canada (Humphreys and Ruseski, 2010) and Scotland (Eberth and Smith, 2010).

Gender is a highly important influence on sport participation. There is consensus about the fact that men, in general, not only participate in sport more than women (Breuer and Wicker, 2008; Downward, 2007; Downward and Rasciute, 2011; Eberth and Smith, 2010; Fridberg, 2010; Hovemann and Wicker, 2009; Humphreys and Ruseski, 2006, 2007; Lera-López and Rapún-Gárate, 2007; Moens and Scheerder, 2004; Stratton et al., 2005; Wilson, 2002) but they also show a higher frequency of participation (Barber and Havitz, 2001; Eberth and Smith, 2010; Humphreys and Ruseski, 2006, 2007). These differences can be attributed to different variables such as biological factors and cultural and social influences, reflecting differences in family responsibilities as well as differences regarding behavior, social expectations and work. Nevertheless, in a recent study, Humphreys and Ruseski (2010) report that the relationship is more complex. According to their results, women are more likely to participate in five different sports (walking, swimming, cycling, running, home

Table 25.1 Summary of empirical studies on sport participation

Study, country and year	*Sample characteristics*	*Dependent variable (estimator)*	*Methodology*	*Evidence/Findings*
Downward and Riordan (2007) UK, 2002	2002 General Household Survey N = 14,819 16 years and over General sports participation	1. Sport participation (yes/no) in the last 4 weeks 2. Frequency of sport participation	Two-step Heckman model	1. Membership of sport clubs (+), Skilled manual worker (+), Drinking (+), Age (−), North regions (−), Housekeeper (−), Voluntary work (−), Number of sports (+), Sport lifestyle (−). 2. Health (+), Number of sports (+), Sport lifestyle (+), Recreation lifestyle (+) Leisure lifestyle (−), Number of males in the household (+), Education (−), Employment (−), Income (−), Unpaid work (+), Access to a vehicle (−).
Downward (2007) UK, 2002	2002 General Household Survey N = 14,819 16 years and over	1. Sport participation (yes/no) in the last 4 weeks	Logistic regression modeling	Income (+), Total work hours (−), Education (+), Working (+), Male (+), Housekeeper (−), Children (−), Number of adults in the household (−), Drinking (+), Smoking (−), White (+), Access to a vehicle (+), North regions (−), Volunteering (+), Age (−), Health (+), Leisure activities (+).
Humphreys and Ruseski (2007) US, 1998 and 2000	1998 and 2000 BRDSS N = 275,455 18 years and over 55 Sporting activities, classified into 5 categories	1. Sport participation (yes/no) in the last month 2. Frequency of sport participation (number of times per week)	Two-step Heckman model	1. [(1)] Age (+), Income (+), Education (+), Female (−), White (+), Married (−), Children (−), Employed (+), Retired (+), Urban (+), Health (+). 2. [(2)] Age (−), Married (−), Income (+), Female (−), Urban (−), Education (+), Employed (+), Retired (+), White (−).
Humphreys and Ruseski (2006) US, 2000	2000 BRDSS N = 150,648 18 years and over 56 Sporting activities	1. Sport participation (yes/no) in the last month 2. Time in sport participation (minutes per week)	Two-step Heckman model	1. Age (−), Married (−), Children (−), Income (+), Employed (−), Retired (+), Education (+), Female (−) White (+), Health (+). 2. Age (+), Married (+), Income (−), Employed (+), Education (−), Female (−), White (+).

(*Continued overleaf*)

Table 25.1 Continued

Study, country and year	*Sample characteristics*	*Dependent variable (estimator)*	*Methodology*	*Evidence/Findings*
Moens and Scheerder (2004) Flanders (Belgium) 1979, 1989, 1999	PF/SBV Flemish Sports Participation Time Lag Survey (1979, 1989, 1999) and TOR 1999 Flemish Time-budge Study N = 39,911 Parents of school-aged children General sport participation	Participation in sport (yes/no)	Logistic regression modeling in two phases	Education (+) Females (−), Age (−), Degree of urbanization (+, no in 1999), Socio-cultural associations participation (+), Watching TV (−).
Scheerder and Breedveld (2004) Flanders and the Netherlands, 1989, 1991 and 1999	SCP Facilities Usage Survey (1991 and 1999) and PF/SBV Flemish Sports Participation Lag Survey (1989 and 1999) N = 32,483 General sport participation in Flanders and 27 sports in the Netherlands	1. Participation in sport (yes/no) 2. Club membership (yes/no)	Binary logistic regressions in two phases	Age (−), Male (+, only in adults and no in adolescents), Education (+).
Stempel (2005) US, 1998	1998 US National Health Interview Survey N = 22,500 25–79 years 15 competitive sports	1. Participation in sports one or more times at least 30 in the last two weeks 2. Frequency and intensity of sports participation over the prior two weeks	Logistic regressions	Education (+). Income (+).
Lera-López et al. (2008) 2006 Spain	2006 Spanish Sport Participation Survey (CSD) N = 640 18–74 years	1. Participation in sports during the previous year 2. Frequency of sport participation	Probit and ordered probit models	Male (+), Age (−), Education (+), Socio-economic level (+), Motivation for health (+), Entertainment (+), Self-reported general health (+).
Lera-López and Rapún-Gárate (2007) Navarra (Spain), 2003	Primary data N = 700 16–65 years 40 Sporting activities	1. Frequency of sports participation in the previous year (5 categories, from no practice to every day) 2. Frequency of sports participation among regular practitioners (4 categories)	Ordered probit models	1. Female (−), Age (+), Income (+), Entrepreneur (−), Self-employed (−), Farmer (−), Middle manager (−), Skilled worker (−) Unskilled worker (−). 2. Age (+), Income (+), All occupations (−).
Wilson (2002) US, 1993	1993 General Social Survey N = 1,458 Age unspecified Leisure-time activities (sports)	Sport participation in the last year	Multiple classification analysis	Males (+), Education (+), Income (+).
Stamm and Lamprecht (2005) Switzerland, 2002	2002 Swiss Health Survey N = 17,344 15 years and over Physical activities	Degree of physical activity (five categories, from regularly to inactive)	Contingency and gamma analyses	Female (−), Language region (+), Household size (+), Income (+), Nationality (+), Education (+).
Breuer and Wicker (2008) Germany, 1984–2005 period	1984–2005 German Socioeconomic Panel N = 141,129 General sporting activities	Regular sport activity (at least once per week, yes/no)	Multivariate regression	Female (−), Age (−), Income (+), Education (+), Real work time (−), Non-German nationality (−).
Wicker, Breuer, and Pawlowski (2009) Stuttgart (Germany)	Primary data N = 2,054 3 years and over General sporting activities	Regular sport activity (at least once per week, yes/no)	Logistic regression and hierarchical non-linear models	Female (−), Age (−), Nationality (+), Education (+), Time for bringing up children (+), Income (+), Supply of sport infrastructure (+).

(*Continued overleaf*)

Table 25.1 Continued

Study, country and year	*Sample characteristics*	*Dependent variable (estimator)*	*Methodology*	*Evidence/Findings*
Barber and Havitz (2001) Canada, 1987 and 1996 years	1987–1996 Print Measurement Bureau N = 13,901; 20,415 18 years and over 10 sporting activities	Frequency of sport participation during the season (ordinal variable with three categories: occasional, regular, avid)	Cross-tabular analyses	Female (−). Age (−).
Scheerder, Vanreusel and Taks (2005a) Flanders (Belgium), 1979–1999 period	1979 Leuven Growth Study of Flemish Girls, 1989/1999 Study on Movement Activities in Flanders N= 38,376 (M+F) 19–77 years (parents of elementary and high school children).	1. General participation in the year (yes/no) 2. Organizational context of sports participation (club-organized and non-organized participation) 3. Participation in six distinct types of sports disciplines	Logistic regression modeling and canonical correlation analysis	Social class (+), Female (−), Age (−), Family size (−), Urbanization (+). Divorced people (−). Sport participation remains socially stratified in the 80s–90s.
Scheerder, Vanreusel and Taks (2005b) Flanders (Belgium), 1979, 1999–2002 period	1979 Leuven Growth Study on Flemish Girls and primary data from the authors (1999–2002) N = 257 females 32–41 years	1. Sports participation for an average of one hour or more per week over a whole year (Adolescence and adulthood). 2. Non-participation in sports (Adolescence and adulthood)	Logistic regression and structural equation modeling	Participation during adolescence (+), Sport practice of the partner (+), Education (+), School program, Age (non-lineal), Parents sport participation (+, only for youth), Parental social class (+, only for youth).
Farrell and Shields (2002) England, 1997	1997 Health Survey of England N= 3,811 households, 6,467 individuals 16-65 years 10 most popular sporting activities	1. Sport participation in the last 4 weeks for more than 15 minutes (yes/no) 2. Participation in every sport in the last 4 weeks for more than 15 minutes (yes/no)	Random-effects probit modeling	Male (+), Age (−), Married (−), Infant (−), Children for males (+), Ethnic minority (−), Education (+), Drinking (+), Smoking (−), Health (+), Income (+), Unemployed (+), Household membership (+).
Downward and Rasciute (2010) UK, 2008	2008 DCMS Taking Part Survey N = 7,080 16 years and over 67 sports activities and 24 other leisure activities	1. Ratio of the number of sports activities/number of leisure activities	Tobit model	Age (−), Male (+), Education (+), Income (+), White (+), Number of children (+). Regional effects.
Spinney and Millward (2010) Canada, 2005	2005 Statistics Canada's General Social Survey on Time Use (GSS-TU) N = 14,452 15 years and over 183 physical activities	1. Energy expenditure on physical activities including only moderate and higher intensity	Pearson's conditions and Maun-Withey U technique	Income and time poverty influence on the intensity in physical activity.
Stratton, Conn, Liaw and Conolly (2005) Australia, 2002	2002 General Survey N = 15,500 18 years and over Sports and physical activities	1. Participation in sports and physical activities in the last 12 months	Multiple logistic regression	Proficiency in English (+), Self-assessed health status (+), Age (+), Female (+), Social contact (+), Access to transport (+), Socio-economic status (+), Income (+), Education (+).
Lechner (2009) Germany, 1984–2006	1984–2006 German Socio-economic panel study N = 6,751 18–45 years	1. Frequency of sports participation in the last year. Two samples: participant less than monthly and participant at least monthly	Probit model	Female (−), non-German (−), education (+), income (+), job quality (+), married (−), age (−), number of children (−).
García, Lera-López and Suárez (2010) Spain, 2003	2002–2003 Spanish Time-use Survey N = 27,268 18–65 years Sports and physical activities	1. Likelihood of participation in sports and physical activities 2. Time (hours) spent in sports and physical activities Two samples (female and male)	Probit model and Seeming Unrelated Regression (SUR) method	Likelihood: education (+), children (−), marital status for female (+), for male (−), age (U-shaped curve), size of population (+), health (+, only for male). Time: income (−), age (+), health (−), married (−), number of children (+).

(*Continued overleaf*)

Table 25.1 Continued

Study, country and year	*Sample characteristics*	*Dependent variable (estimator)*	*Methodology*	*Evidence/Findings*
Breuer and Wicker (2009) Germany, 1985–2005	1985, 1986, 1988, 1992, 1994, 1996, 1997, 1999, 2001, 2005 German SOEP N = 3,012	1. Dichotomized variable: regular sports participant (yes/no)	Anova	Women's regular sport participation is stable and does not decrease with age while in men, regular sport participation decreases with age.
Stamatakis and Chaudhury (2008) UK, 1997–2006	Health Survey for England (HSfE) Years: 1997, 1998, 2003, 2004 and 2006 N = 27,213 men and 33,721 women	1. Taking part in any of a list of sports in the four weeks before the interview Two samples (female and male)	Multiple logistic regression models	Female: age (−), social class (+), household income (+), education (+), general health status (+), ethnicity (−). Male: age (−), social class (+), household income (+), education (+), general health status (+).
Humphreys and Ruseski (2010) Canada, 2001	2001 Canadian Community Health Survey (CHHS) N = 99,322 Persons aged 12 or older Sport and physical activities	1. Participation in sports and physical activities 2. Time in sports and physical activities	Double hurdle model for only seven sports: swimming, golfing, weightlifting, running, walking, home exercise, cycling	1. Income (+), hourly wage (+),education – college (+), white collar job (−), different effect of age and gender depending of the activity. 2. Income (−), hourly wage (+), education – college (+),white collar job (+), different effect of age and gender depending of the activity, married (−), young children (−).
Eberth and Smith (2010) Scotland, 2003	2003 Scottish Health Survey (SHeS) N = 4,380 16–64 years General sporting activities	1. Decision to participate in sporting activities 2. Duration of time spent undertaking their sporting activities	"Copula approach" for maximum likelihood estimates	Positive association between sport decision and duration. 1. Age (+), male (+), smokers (−), alcohol consumption (+), hours spent watching TV (−), children aged 0–2 (−), children aged 2–15 (+), household income (+), education (+), self-reported general health (+). 2. Female (+), age (−), single (+), watching TV (−), self-reported general health (+), smoking (−).
Van Tuyckom, Scheerder and Bracke (2010) EU-25	2005 Eurobarometer Survey 62.0 N = 23,909 Population aged 18 years and older General sporting activities	Dichotomized variable regular and non-regular sports participants	Binary logistic regression	Male (+) and female (−), although with differences among the European countries.
Van Tuyckom and Scheerder (2010) EU-27	2004 Eurobarometer Survey 64.30 N = 26,688 Population aged 15 years and older Physical activities	How much physical activity in the last 7 days?	Bivariate analyses	Male (+), age (+), educational level (+), degree of urbanization (+), South and East European countries (−).
Hovemann and Wicker (2009) EU-25	2004 Eurobarometer Survey 62.0 N = 23,909 Population aged 18 years and older General sporting activities	Dichotomized variable regular and non-regular sports participants	Binary logistic regression	Age (−), married (−), occupation (−), children (−), male (+), degree of urbanization (+), educational level (+).
Fridberg (2010) Denmark, 1964–2004	Surveys on cultural and leisure time activities in 1964, 1975, 1987, 1993, 1998, and 2004 Population aged 15 and above	Regular participants (at least once a week)	Bivariate analysis	Age (−), occupation (−), educational level (+).

(1) For household activities and walking, age, female and married variables/categories are positively associated with sports participation. Urban variable is negatively related to outdoor recreation.

(2) Employed variable is negatively related to household activities, individual sport and walking. White is positively associated with group and individual sports participation.

exercise and weightlifting) and spend more time in three out of five than men (walking, exercise at home and swimming). Also, these differences are less marked among older adults in physical activity participation (Bauman et al., 2009) and it seems that the gap in sport participation between men and women has narrowed in some countries in the last ten years (Fridberg, 2010; Stamatakis and Chaudhury, 2008).

Sport participation requires consumption of some sporting goods and services, and/or the ability to have the time available to pursue sport whilst not crowding out other consumption requirements needing income. Many studies, therefore, include the influence of economic variables, such as household or individual annual income. The literature provides evidence that lower income may act as a barrier to sport participation (Breuer and Wicker, 2008; Downward and Rasciute, 2011; Eberth and Smith, 2010; Farrell and Shields, 2002; Humphreys and Ruseski, 2006, 2007, 2010; Lera-López and Rapún-Gárate, 2007; Spinney and Millward, 2010; Stempel, 2005; Stratton et al., 2005; Wicker et al., 2009; Wilson, 2002). Nevertheless, among regular practitioners, income has no influence on the frequency of their sport participation (Gratton and Taylor, 2000) or the influence is negative (Downward and Riordan, 2007; García et al., 2010; Humphreys and Ruseski, 2006, 2010). This could be explained because the higher the income, the higher the opportunity cost of time spent on any leisure activity (García et al., 2010). In addition, some studies have analyzed the role played by professional status in sport participation. This is likely to be correlated to income. Less sport participation in general has been found among certain occupational segments in the lower socio-economic groups and non-skilled workers (García Ferrando, 2006; Lechner, 2009; Lera-López and Rapún-Gárate, 2007; Stratton et al., 2005). It seems that this gap between high and low socio-economic groups has not been narrowing in the last ten years (Stamatakis and Chaudhury, 2008). Additionally, Humphreys and Ruseski (2010) show that people in white-collar jobs are less likely to participate in sport, but when they are engaged they spend between 4.7 and 33.5 minutes more per week than people in other types of jobs.

From an economic point of view, and linked to the role of income for the theoretical reasons noted above, another important component in the analysis of the demand for sport is the availability of time. Since time is finite, any increase in the time devoted to sport will always be constrained by competing demands for time from other leisure, work and other uses. The influence of the time constraint could be analyzed indirectly thorough different variables such as income and occupation, as above, as well as some variables related to the family structure. In some analyses working and employment is negatively related to sport participation (Breuer and Wicker, 2008; Downward, 2007; Eberth and Smith, 2010; Hovemann and Wicker, 2009).

The household influence on individual sport participation is commonly analyzed by considering the effect of marital status and size of the household on sport participation rates. Married people participate less in sport and physical activities and dedicate less time to it (Eberth and Smith, 2010; García et al., 2010; Hovemann and Wicker, 2009; Humphreys and Ruseski, 2006), although there are significant differences according to the type of activity (Humphreys and Ruseski, 2010), gender (Eberth and Smith, 2010) and the frequency of sport participation (Humphreys and Ruseski, 2007, 2010). In addition, there are significant differences between men and women (Eberth and Smith, 2010).

The size of a household, according to Downward (2007), Humphreys and Ruseski (2006, 2007) and Scheerder et al. (2005a), was negatively associated with sport participation. In Downward (2004) and Farrell and Shields (2002) the effect was not clear and varied according to the type of sport considered. Children may limit the time available for adult sporting activities such as aerobics and running while increasing participation in child-oriented sport

such as football or swimming (Downward, 2004). In fact, Humphreys and Ruseski (2010) show that people with young children dedicate more time in family-oriented sport activities like riding bikes and swimming. Stratton et al. (2005) report that families where there are dependent children have the highest rate of sport participation whereas Lechner (2009) reports that young children in the household are negatively associated to sport participation. In Downward and Rasciute (2011) households of a greater number of adults and children are more likely to participate in sport activities than other leisure activities. Finally, García et al. (2010) report that in general children decrease the likelihood of being involved in sport and physical activities but when people with little children decide to participate, they allocate more time to sport than people without children. In addition, in the analysis of the household impact, the parental influence on sport participation has been included in different empirical studies. Children and adolescents who perceive parents to be active report the highest sport participation rates (Berger et al., 2008; Dollman and Lewis, 2010; Taks and Scheerder, 2006).

Traditionally, educational level has been included in the analysis of sport participation. A higher level of education might lead to a greater awareness of the benefits and importance of sport as well as being associated with higher hourly wages and more available resources to take up sporting activities. Also, higher education is more likely to be associated to a sedentary occupation (Fridberg, 2010). Finally education includes habits developed as a student, when access to sports facilities is easy and relatively inexpensive. Indeed, a positive relationship between education and sports participation has been reported in different studies (Breuer and Wicker, 2008; Downward, 2007; Downward and Rasciute, 2011; Eberth and Smith, 2010; Fridberg, 2010; Hovemann and Wicker, 2009; Humphreys and Ruseski, 2006, 2007, 2010; Lechner, 2009; Stempel, 2005; Stratton et al., 2005; Wicker et al., 2009; Wilson, 2002). In terms of the frequency of sport participation and time spent, some authors report a negative relationship with educational attainment (Downward and Riordan, 2007; Humphreys and Ruseski, 2006). Nevertheless, for participation in seven different sports in Canada, Humphreys and Ruseski (2010) show that people with a high school or college education spend between 9 and 43 minutes more per week playing sport than people with less than a high school education.

Many studies include variables measuring the influence of the availability of sport facilities in sport demand. Generally speaking, a degree of sport supply should induce sport demand and participation. For example, Downward and Rasciute (2011) report that sport facilities do promote participation in sport relative to leisure. Wicker et al. (2009) show that a poor supply of sport facilities reduces the regularity of sport activities. Other studies have included the size of population as a proxy variable to measure the availability of sport facilities. On the one hand, the empirical evidence might lead us to expect less access to certain types of sporting facilities in rural areas than in the suburbs or cities (Andreff and Nys, 2001; Hovemann and Wicker, 2009). On the other hand, in large cities there would be more availability of a wider range of entertainment options and consequently more substitute leisure activities for sport activities. This could have a negative effect on the general level of sport participation, as demonstrated by Moens and Scheerder (2004), García et al. (2010) and Scheerder Vanreusel and Taks (2005a).

A large set of studies has focused on the motivations for getting involved in sport. A better understanding of people's motivations for sport involvement offers significant opportunities to develop more effective sport management and marketing strategies to attract new participants. The empirical evidence shows that the most relevant benefits of, and motivations for, sport participation are physical fitness and health, entertainment, relaxation, sense of

achievement and skill development and socialization (Bloom et al., 2005; European Commission, 2004; Fridberg, 2010; García Ferrando, 2006). For example, to 78 percent of citizens in 25 European countries, improvement of health is the major benefit of playing sport. In addition, 31 percent of Europeans find that a major benefit of playing sport is to meet with friends and 39 percent identify the major benefit as entertainment and having fun (Fridberg, 2010). Finally, from an economic perspective, participation in other sports also strongly affects participation in any given sport, and the types of sport undertaken. This can be viewed as resulting from the accumulation of personal consumption and social capital (Downward and Riordan, 2007).

Data, variables and method

Data set

In this section, an analysis of sport participation in Spain is presented, to illustrate the empirical approach and theoretical arguments made earlier. The main characteristics of the database drawn upon, as well as the variables included in the analysis, are presented first.

The database is based on a survey developed by the Centro de Investigaciones Sociológicas (CIS), an independent entity established to study Spanish society, mainly through public opinion tools. This survey was financed by the Spanish High Council for Sport (CSD), a Spanish public institution in charge of sport, with the goal of obtaining detailed information about Spanish sport habits. The survey was conducted during the period between March and April 2005 in face-to-face interviews and it generated a sample of 8,170 individuals aged between 18 and 74 years. The sampling method is based on stratified sampling of municipalities and random sampling of addresses within municipalities, following gender and age proportions of the population. In each of the selected sampling points (municipalities), a starting address was drawn at random. Further addresses were selected by standard "random route" procedures from the initial address, commonly used in the European surveys developed by Eurostat, for example. The survey was developed in 389 different towns and villages in the 17 Spanish regions. The confidence level is estimated at 95.5 percent with a sampling error of +/−1.11 percent.

The questionnaire consists of four parts. The first part includes questions concerning the frequency with which the individual performs sporting activities, what types of sport have been practiced, the motivation for this participation, types of sporting facilities available and if club sports are undertaken. The second part includes questions to non-participants to study their motives. The third part investigates opinions concerning public financial support for mass sport participation and professional team sport, and the quality of sporting facilities in the municipalities. The fourth includes questions about the problem of doping. The fifth part of the questionnaire focuses on passive sport participation, defined as attendance at amateur and professional sporting events, watching sport events on television, and reading sport newspapers. The final part of the questionnaire measures the socio-demographic characteristics of respondents such as their gender, age, educational level, employment status and socio-economic status.

Variables

To model sport participation, a number of variables are used in this study. The key dependent variables that are investigated in this chapter are ANYSPORT and SPORTFREQUENCY.

These variables are derived respectively from questions that ask first, "Do you practice any sport?" where a binary "yes/no" answer is required; and second, "What is the frequency of your sport participation: three or more times/1–2 times/less/only on holidays?" This is an ordered variable. In this study, the answer "no" to the first question was taken as a possible outcome for the ordered variable. As discussed earlier, this essentially treats the "no" response as a credible choice by respondents.

The variable ANYSPORT takes the value zero if the person is a non-participant and value one if the respondent has participated in sporting activities. It can be seen as an aggregate measure of sport participation and is modeled using a probit estimator. The second variable, SPORTFREQUENCY, is an ordinal variable measuring the frequency of sport participation. The value zero is given to people who don't practice sport, value one if the sport participation is only on holidays, value two if the frequency of sport participation is less than once per week, value three if participation is at least once or twice per week, and value four if the frequency is three times or higher. As an ordered relationship, increasing participation is noted, but the increases are not uniformly calibrated.

The use of these two dependent variables loosely corresponds to examining a potentially twofold decision made with respect to participation. This includes whether or not to participate in sport and, subsequently, what intensity of participation is undertaken. As noted earlier, such data could lend itself to a variety of estimators such as the Heckman sample selection model, or other hurdle models. The important thing about these models is that the occurrence or not of sampling units for a given set of variables is implied by a given sampling rule (see, for example, Cameron and Trivedi, 2005; Wooldridge, 2002). In the current context, the value of zero has the character of a real limit to behavior. Further, the dependent variable is ordered rather than continuous. It is these circumstances that lead to the choice of the ordered model in exploring frequency.

The covariates employed in the analysis are given in Table 25.2, along with their mean values and descriptions. In addition, column 4 indicates whether or not the variable was included in the ANYSPORT probit equation (P) or the SPORTFREQUENCY ordered probit equation (O).

The first set of variables in the analysis comprises basic socio-demographic characteristics, which are included in both regressions and have been broadly considered in the empirical evidence. These include the age of the respondent, and their sex, class and education. Age is included linearly as well as in a squared form as it is possible that both participation and its frequency might vary in a nonlinear way with age. For example, one might expect a rapid decline in competitive sport with age but, perhaps, less so with more leisurely sport.

As discussed above, it is a standard finding in the literature that males participate more than females and such a prediction is evident in the unconditional proportion of the sample given by the mean value of the sex dummy variable. As no direct income variable could be employed in the analysis due to missing values, social class variables are used as proxies, with the expectation that positive signs will be generated. The same is true for the education variables. The sample characteristics show that higher levels of education are rarer, and it would be expected that these would promote more sport participation because of the generation of relevant tastes and higher incomes as discussed in the literature.

The remaining variables investigated comprise elements of the formation of tastes for sport, that is, the human and social capital required to consume sport, as well as the opportunity costs involved in practicing sport. Consequently, in general terms, in the former case it is to be expected that parental involvement in sport, the membership of a sport association or federation, or participation in an organized group or alone would affect participation in a

Table 25.2 Variable description

Variable	*Mean*	*Type*	*Model*	*Label*
NUMFREET	7.87047	Count	O	Number of free time activities other than doing/ watching sport
AGE	41.4079	Cardinal	P/O	Age in years
AGESQ	1981.01	Cardinal	P/O	Age squared in years
SEX	.513896	Nominal	P/O	Male =1 Female = 0
FATHERSP	.217866	Nominal	P	Has father practiced sport? 1 = yes, 0 = no
MOTHERSP	.113896	Nominal	P	Has mother practiced sport? 1 = yes, 0 = no
UPPERCLA	.744417E-01	Nominal	P/O	Upper class? 1 = yes, 0 = no (base = other class)
MIDDLECL	.361290	Nominal	P/O	Middle class? 1 = yes, 0 = no (base = other class)
PRIMARYS	.554839	Nominal	P/O	Primary School? 1 = yes, 0 = no (base = no study)
SECONDST	.286600	Nominal	P/O	Secondary School? 1 = yes, 0 = no (base = no study)
UNIVERSI	.972705E-01	Nominal	P/O	University? 1 = yes, 0 = no (base = no study)
CLUBMEMB	0.230273	Nominal	O	Member of a sport club? 1 = yes, 0 = no
ADEQFAC	.367990	Nominal	P	Adequate facilities nearby? 1 = yes, 0 = no
SPORTFIT	.986600	Nominal	P	Sport keeps you fit? 1 = yes, 0 = no
SPORTESC	.902978	Nominal	P	Sport is an escape valve? 1 = yes, 0 = no
SPORTSIB	.935484	Nominal	P	Sport allows social interaction? 1 = yes, 0 = no
SPORTLFB	.884367	Nominal	P	Sport allows living life to the full? 1 = yes, 0 = no
SPORTPDB	.837965	Nominal	P	Sport produces personal development? 1 = yes, 0 = no
SPORTCOM	0.049876	Nominal	O	Participates in sport competitions? 1 = yes, 0 = no
SPORTFED	0.073697	Nominal	O	Belongs to a sport federation? 1 = yes, 0 = no
SPORTALO	0.093052	Nominal	O	Plays sport alone? 1 = yes, 0 = no
SPORTORG	0.90323	Nominal	O	Plays sport in an organized way? 1 = yes, 0 = no
HEAVYJOB	.538462E-01	Nominal	P	Has a heavy job? 1 = yes, 0 = no
WALKMOVE	.123573	Nominal	P	Walk and move a lot at work? 1 = yes, 0 = no
WALKBIN	.592060	Nominal	P/O	Walks for fitness? 1 = yes, 0 = no
SPORTWAT	.378412	Nominal	P/O	Watches sport in free time? 1 = yes, 0 = no
N = 4030				

positive way. However, it is theorized that parental involvement would affect the decision to participate, by shaping tastes, whereas membership of a sport club and a form of participation will be linked to the frequency of the practice of sport. In the latter case, opportunity costs of sport are more likely to apply when it is likely that other non-sport free time activities are undertaken, that adequate sport facilities are not available, or that work involves physical demands or much walking; therefore, these factors might reduce participation. The same could be the case for walking as a fitness activity, or watching sport, rather than practicing it. Of course, it may well be that watching and practicing sport are complementary rather than substitute activities (Dawson and Downward, 2011).

More specifically, because the number of free time non-sport activities measures the extent of other leisure activities this is included in the frequency equation. The same is true of walking for fitness and watching sport on TV. However, these two variables are also included

in the probit equation as substitutes because of their binary nature. The same is true of the characteristics of work. In contrast, all of the motivational aspects of sport participation investigated are employed in the probit equation only as they are concerned with the likely desire to practice sport *per se*. These variables can also be theorized as measuring the human and social capital arising from sport participation.

Method

As noted in the previous section a twofold empirical strategy is adopted in this chapter. The foundation of the approach can be an underlying random utility, or latent variable, in which continuous latent utility y_i^*, as given in equation 25.1, is observed in a discrete form (Greene and Hensher, 2010).

$$y_i^* = \beta' x_i + \varepsilon_i, i = 1,...,N. \tag{25.1}$$

The vector x_i is a set of K covariates that are assumed to be strictly independent of ε_i; x_i is a vector of K parameters. In the probit estimator used to explore the likelihood of ANYSPORT participation or not, observations of the latent continuous utility in discrete form are given by

$$y_i = 0....if....y_i^* \leq 0. \tag{25.2(a)}$$

and (25.2)

$$y_i = 1....if....y_i^* > 0. \tag{25.2(b)}$$

This implies that utility from any form of sport participation is captured by a discrete binary indicator. In the ordered probit estimator, to model the SPORTFREQUENCY the continuous latent utility y_i^* is observed in a discrete form through the censoring mechanism:

$$\begin{aligned} y_i &= 0 \text{ if } \mu_{-1} < y_i^* \leq \mu_0, \\ &= 1 \text{ if } \mu_0 < y_i^* \leq \mu_1, \\ &= 2 \text{ if } \mu_1 < y_i^* \leq \mu_2, \\ &= ... \\ &= J \text{ if } \mu_{J-1} < y_i^* \leq \mu_J. \end{aligned} \tag{25.3}$$

The thresholds μ divide the range of utility into cells that are then identified with the observed frequencies of sport participation. An important feature of the ordered choice model is that the threshold parameters have no obvious interpretation, though they can indicate something about the distribution of preferences of individuals (Greene and Hensher, 2010).

In these models, the effect of a change in one of the variables in the model depends on all the model parameters, the data, and which probability (cell) is of interest. Therefore, one possibility is to compute partial effects to give the impacts on the specific probabilities per unit change in the covariate. The partial effects in the probit model are given by Equation 25.4.

$$\frac{\partial \Pr ob[y_i = 1 | x_i]}{\partial x_i} = \phi(\beta' x_i)\beta \tag{25.4}$$

where the first term on the right-hand side is the derivative of the standard normal cumulative distribution function.

For the ordered choice model, they are expressed as

$$\delta_i(x_i) = \frac{\partial \Pr ob(y = j | x_i)}{\partial x_i} = [f(\mu_{j-1} - \beta' x_i) - f(\mu_j - \beta' x_i)\beta] \tag{25.5}$$

In this case, under certain conditions it might be regarded that a positive (negative) coefficient is connected with a reduction (increase) in the probability in the lowest cell and an increase (reduction) in the probability in the highest cell. With the single crossing feature of the model, such that some probabilities fall and some rise, one can imply that probabilities have shifted in a particular direction. In this respect a positive sign on the coefficient implies that probabilities have shifted in favor of the higher ordered values of the variable. In fact, the same form of logic applies to the probit model, in which the appropriate marginal effects capture the actual changes in the probability of the outcome scored "1" as the dependent variable, giving uniquely scaled magnitudes.

Results

Table 25.3 lists the regression results for the probit and ordered probit analysis with statistically significant values denoted by ***, ** and * referring to significance at 1, 5 and 10 percent respectively. The marginal effects are noted in the third column for each model, for statistically significant coefficients.

Taking the probit model first, and the analysis of participation in ANYSPORT or not, the age variables suggest that there is a nonlinear effect on participation and, in particular. the decline takes place steeply at first, but then it slows down as higher age is reached.[5] This result could be explained by the increasing awareness of sport participation and health among the elderly, or their "sport literacy" as compared to earlier generations. As indicated by the literature reviewed earlier, males are more likely to participate in sport than females and, as revealed by the marginal effects, this is the dominant influence on participation. However, parental participation in sport is the next largest effect, particularly stemming from the sport activity of fathers. This indicates a strong household influence on tastes, and it is a unique result in the literature, which has tended to only analyze the effect of the number of other adults and children in the household.

As is also expected from the literature, higher social class and education are associated with an increase in the probability of participating in ANYSPORT which, as discussed earlier, can be associated with an increase in human and social capital. Similarly, the results indicate that the motivations to participate in sport, which can be associated with human and social capital, are also likely to raise participation in ANYSPORT. Significantly, just doing sport to stay fit is not a significant determinant of the probability of participation. This might suggest that policy simply promoting the health benefits of sport may be unsuccessful. Socialization and entertainment motivation seems to be statistically relevant to the explanation of the probability of participating in sport. Finally, the availability of sport facilities is not statistically significant in explaining the decision to participate in sport activities. This result might also

Table 25.3 Regression results

	Probit model			*Ordered probit model*		
Covariates	*Coefficient*	*t-stats*	*ME*	*Coefficients*	*t-stats*	*ME*
Constant	−.92756***	−3.09		−0.13097	−0.64	
NUMFREET				−0.00436	−0.74	
AGE	−.04364***	−5.52	−0.0152	−.04539***	−5.62	−0.00479
AGESQ	.00030***	3.28	0.0001	.00033***	3.48	0.00003
SEX	.43975***	9.07	0.15178	.29936***	5.76	0.03158
FATHERSP	.35550***	6.11	0.12924			
MOTHERSP	.24262***	3.24	0.08816			
UPPERCLA	.22151**	2.49	0.08054	.18185**	2.00	0.02175
MIDDLECL	0.0659	1.36		.11355**	2.27	0.01231
PRIMARYS	.29567**	2.33	0.10183	−0.11406	−0.86	
SECONDST	.45975***	3.43	0.16651	−0.07643	−0.55	
UNIVERSI	.54212***	3.75	0.2043	0.02634	0.17	
CLUBMEMB				.87686***	16.06	0.13617
ADEQFAC	0.02111	0.47				
SPORTFIT	0.08738	0.4				
SPORTESC	.17347**	2.04	0.05806			
SPORTSIB	.24604**	2.48	0.08045			
SPORTLFB	.23329***	2.73	0.07712			
SPORTPDB	.15804**	2.25	0.05342			
SPORTCOM				.59678***	5.05	0.09533
SPORTFED				.51902***	5.87	0.07752
SPORTALO				1.83952***	27.33	0.47924
SPORTORG				.96681***	11.72	0.18337
HEAVYJOB	−0.01637	−0.16				
WALKMOVE	−0.07882	−1.16				
WALKBIN	0.01744	0.38		.15829***	3.24	0.01634
SPORTWAT	.21444***	4.55	0.07557	.17310***	3.23	0.01894
Mu(1)				1.04621***	28.83	

suggest that policy simply promoting new sport facilities could have a very little effect on sport participation rates in Spain.

In the ordered probit model investigating the frequency of participation, the significant variables suggest that age reduces the frequency of participation in a nonlinear way and that being male will increase the frequency of sport participation, as well as the human capital consequences of social class. Unexpectedly, educational level is not a statistically significant factor explaining the frequency of participation, although it is a relevant factor explaining the probability of sport participation.

The variables associated with the more formal aspects of sport such as sport club membership, belonging to a sport federation, participating in sport competitions or participating in sport in an organized way are, more naturally, associated with increased probabilities of greater sporting frequency. However, the largest effect is associated with playing sport alone. This is probably associated with either endurance activities such as running, swimming or cycling or the fact that they may act as training inputs to other sport activities, such as team sport. Some indirect evidence for this conjecture might be implied from the fact that walking

for fitness is also positively associated with increases in the frequency of sport participation, suggesting that they are complementary activities. In addition, this result could be a consequence of the increasing importance of unorganized sport participation to the detriment of organized participation. Finally, and consistent with Dawson and Downward (2011), it appears that watching sport on television is a complementary activity to practicing sport.

Conclusions

In this chapter the determinants of sport participation and its frequency in Spain have been studied using probit and ordered probit estimators, respectively. Results broadly similar to the existing literature, which is also extensively reviewed in the chapter, are produced.

The results show that the likelihood of sport participation is mainly determined by parental participation in sport (particularly by sport participation of fathers), gender, class and educational level. Age affects sport in a nonlinear way. Sport participation also seems to be motivated by socializing and the need for entertainment. Watching sport on television, further, seems to be a complementary activity to practicing sport.

The frequency of participation decreases with age and increases with being male. Whereas social class is positively associated with higher frequency of sport participation, educational level is not statistically significant. The variables associated with the more formal aspects of sport, such as sport club and sport federation membership, or participating in sport competitions or in an organized way, are logically associated with greater sporting frequency. This suggests that attracting participants to organized sport may enhance their frequency of participation. However, the largest effect on the frequency of sport participation is associated with playing sport alone, emphasizing the importance of sport activities developed in an unorganized way and the complementary relationship with other physical activities such as walking for fitness. Coupled with the steady decline in sport participation, generally, this could suggest changing tastes of participants and increased difficulties of using the formal sport system to achieve social policy aims, an issue noted in the UK by Downward (2011).

Notes

1 In the review that follows, emphasis is upon large-scale data analysis.
2 The logistic function is used to generate the probabilities of outcomes. Farrell and Shields (2002) use a comparable Probit model, which draws on the cumulative normal distribution. They use a panel-data equivalent of this model to identify shared intra-family preferences (see also Downward and Riordan, 2007).
3 Theoretically this identifies a "corner solution." The Hurdle model can be seen as generalizing the TOBIT model in which only one equation is used to model the data.
4 For a literature review on sport participation see Downward et al., 2009 and Breuer et al. (2010). For a review of participation in physical activities following medicine and health approaches see Sallis et al. (2000) for children and adolescents, and Trost et al. (2002) and Humpel, Owen and Leslie (2002) for adults' participation. Finally, for an international comparative analysis among countries in physical participation see Bauman et al. (2002, 2009) and Haase et al. (2004).
5 This is actually inferred from plotting age against participation. In probit and ordered probit models the marginal effects of non-linear terms cannot be inferred from their separate components.

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