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ABSTRACT

Heterogeneous Sports Participation and Labour Market Outcomes in England*

Based on a unique composite dataset measuring heterogeneous sports participation, labour market outcomes and local facilities provision, this paper examines for the first time the association between different types of sports participation on employment and earnings in England. Clear associations between labour market outcomes and sports participation are established through matching estimation whilst controlling for some important confounding factors. The results suggest a link between different types of sports participation to initial access to employment and then higher income opportunities with ageing. However, these vary between the genders and across sports. Specifically, the results suggest that team sports contribute most to employability, but that this varies by age across genders and that outdoor activities contribute most towards higher incomes.

JEL Classification: I12, I18, J24, L83, C21

Keywords: sports participation, human capital, labour market, matching estimation

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1 Introduction

The role that sport plays in society is of a resurgent policy concern. Historically, the traditional emphasis of sports policy was to raise physical fitness levels in the population and to meet the needs of the military (Houlihan, 1997; Green, 2004; Green and Houlihan, 2005). In Europe, in the period after the Second World War, sport became a branch of social welfare (Downward *et al* 2009), ultimately becoming manifest in the development of a 'Sport for All' policy by the Council of Europe in 1966, which captured a general international sentiment. The policy argued that sport helped to promote health, mental and social benefits as well as to achieve various political aims (McIntosh, 1980). Such aspirations have been consolidated through the subsequent European Sport for All Charter of 1975 and European Sports Charters of 1991 and 2001. Symbiotically, interest in the policy promotion of hosting major sports events, like the Olympics, and promoting elite sports success at them has occurred across a diverse range of governments (DCMS/Strategy Unit, 2002; Carter, 2005). For example, in the UK under the Blair government there existed a view that both hosting and achieving success at major events could be the means to achieve policy objectives such as those noted in the Charters through either promoting sport participation, but also because of direct impacts on the well-being of citizens. This perspective was subsequently endorsed following the change in political leadership of the UK after the election of the coalition government in 2012 (DCMS, 2010).

The particular emphasis of most recent sport policy has been to argue that sport is needed to counter the falling level of physical activity and commensurate impact that this has on an individual's health and chances of succumbing to diseases (e.g. Department of Health,

2004; WHO, 2002, 2007).[1] These impacts have been estimated to be £900 million per year in the UK.[2]

Surprisingly, what has received much less attention in the policy discussion is the role that sport participation can play in improving an individual's labour market outcomes, with the related economic benefits to society. This theme is also at the core of this paper. It is distinct from the earlier concerns about the impact of sport on broader social welfare concerns aimed primarily at marginalised populations (see for example Coalter, 2007).

There are two strands of recent academic literature that are developing to inform this issue and to which this paper seeks to contribute. The first strand explores the links between young people's school, college and extra-curricular sports participation and educational performance and attainment, and subsequent earnings. This literature focusses on single measures of sports participation. The second, which is less developed, focusses on the wider population and has, in one case, explored the effects of different sports on the possibility of being called for a job interview. None of this analysis has addressed the situation in the UK.

Consequently, this paper contributes towards filling a gap in the literature by answering the following related research questions. How does participation in different types of sport affect the earnings and employment of the working-age population? Are these effects for the different types of sports heterogeneous with respect to genders and age? These questions are important since it is well known that different types of sporting activities are expected to have different organisational features and aspects of practice, which may affect their impact on the individual (Downward *et al* 2009). It is also well-known that the type and intensity of sports

[1] See also the 2007 White Paper on Sports by the European Commission (http://ec.europa.eu/sport/white-paper/white-paper_en.htm; accessed 04/08/2013).

[2] http://www.sportengland.org/research/benefits-of-sport/health-benefits-of-sport/case-study-engaging-inactive-people/ (accessed 24th September 2013).

related activities vary considerably over age and across genders (Van Tuyckom, *et al* 2010; Breuer and Wicker, 2009; Breuer and Wicker, 2008; Kay, 2003). To address these questions a matching analysis is undertaken based on a unique composite dataset. This comprises the synthesis of three major surveys, all of which report data in a highly disaggregated form, that allow for analysis at local authority level and below. The first is the Active People Survey (APS) that captures the rich heterogeneity, as well as the intensity, of sports participation in England. The APS also provides information on the individual's socio-economic circumstances and consequently provides information on the potential labour market outcomes under review. The second is the Annual Population Survey (APopS) that provides a rich set of socio-economic information. This information is aggregated to local authority level so that it can be matched to the APS.[3] The last is the Active Places Survey (APLS), which reports on the actual supply of sports facilities at the local authority level. The availability of such facilities is a precondition for various sports activities. Lagged aggregated values from the APS, the APopS, coupled with the APLS data on facilities, provide control variables for our analysis that allow to remove some of the confounding of the sports-labour market relationship. This is important because the research design aims to get as close as currently possible to a causal analysis given the limitations of the available data, which is among the best currently available for the UK.

In this regard a two-step empirical strategy is adopted. In the first step, a probit analysis is undertaken to examine how participation varies systematically according to exogenous factors; that is factors that are not influenced by current sports participation. The second step involves the use of non-parametric econometric matching methods examining the relationship between sports participation and labour market outcomes. The analysis thus controls for (some important) selection/confounding effects through the exogenous variables in the first

[3] To conduct the research disaggregated data for the Annual Population Survey was made accessible through Special Licence Access from the Economic and Social Data Service at the University of Essex.

step. To the extent that these variables provide an incomplete set of potential influences on participation then it remains that other unmeasured factors could influence the results and consequently, the analysis retains an associational emphasis. Nonetheless, the analysis does move the literature forward in terms of beginning to identify causal relationships between participation in different types of sports and labour market outcomes.

The results of the empirical analysis show that there is considerable heterogeneity with respect to the type of participants in the different sports. Furthermore, the results indicate large positive associations of sports participation with earnings, which are largest for fitness and outdoor sports. Furthermore, there is a negative relation with unemployment, particularly for males, which goes together with higher employment rates for younger males and higher retirement rates for older males. Comparing the different sports against each other shows that participation in team sports is more associated with increased employability (but that this varies by age and gender) and that fitness and outdoor activities have higher associations with income.

The paper proceeds as follows. In section 2 three strands of literature relevant to the study are reviewed. First, the theoretical mechanisms by which sports participation might produce impacts in the labour market are outlined. This is then followed, secondly, by a brief review of the empirical literature that assesses the impact of these mechanisms. Finally a review of the determinants of sport participation and its impacts on health and social capital is provided in order to assess the adequacy of the components of the empirical models estimated. In Section 3 details of the dataset are provided. Section 4 outlines the measures of sports participation that are employed in the analysis, as treatment effects, and describes the allocation of these treatments over individuals. Section 5 presents the results of the matching estimation. Conclusions follow in Section 6. The appendix provides further descriptive statistics.

2 Literature review

2.1 Theoretical issues

The main theoretical premises by which sports participation may affect labour market outcomes that are referred to in the literature are based on the impacts that sport participation has on time allocation and human capital. Consequently, building on the basic proposition from Becker (1965) that an individual, through allocating time and market goods, produces the 'final' goods that they ultimately consume to contribute to their utility, means that an individual invests time and other resources in practicing sport as opposed to allocating these resources to education. Presented in this way, as two mutually exclusive alternatives, implies that sport participation crowds out investment in human capital with the implication that there will be a negative relationship between sports participation, employability and earnings (Barron *et al* 2000). Essential to this argument is a basic premise of human capital theory, which since the seminal contributions of Mincer (1958) and Becker (1964), has argued that enhancement in cognitive skills is delivered through investment in education, and that these enhance an individual's productivity and consequently their employment prospects and earnings directly or through signalling (Spence, 1973).

This negative hypothesised relationship, however, can be challenged from a number of alternative theoretical positions, based either on refinements of human capital theory, or in embracing the role of externalities derived from the practice of sport. These alternatives suggest a positive relationship between sports participation, employability and earnings.

In the first instance, Heckman and Rubinstein (2001), Heckman and Carneiro (2003) and Heckman *et al* (2006) contribute to the foundations of the human capital approach by emphasising the importance of the role of non-cognitive skills in the development of human capital. These skills might comprise social adaptability and informal sources of learning, such

as work experience and learning-by-doing. From such a perspective it is easy to see how sports participation might develop these skills. For example Pfeifer and Cornelissen (2010) argue that sport might be considered a 'good' leisure activity that builds character, good habits and self-esteem and hence add to the productivity of the individual in contrast to a 'bad' leisure activity such as TV watching. Though they do not develop the mechanisms of such claims, one could suggest that sports might help to develop complementary time management, task prioritisation, and pedagogical approaches to learning as with education, in comparison to the passive activity of watching TV. In other words sports participation can provide cognitive and non-cognitive human capital that is complementary to the mainly cognitive element provided by education.[4]

In the second instance, these arguments hint at the role that externalities might play as spillovers from sports participation to labour market outcomes. Lechner (2009) for example, recognises that these could occur through the impact that sports participation has on health and fitness as well as social abilities. In this regard it might be argued that human capital development can have both health and social capital outcomes, which are now recognised as being themselves highly correlated (Rocco *et al* 2013).

For example, in the case of health, building on the foundations of Becker (1965), Grossman (1972) argues that health can be viewed as a stock of capital that yields a flow of healthy time. Health stocks can depreciate with age or be enhanced by investment in, for example, health care. In the current context this means that engagement in sports activity as an investment in healthcare can affect the productive quality of time through physical fitness

[4] One could of course easily argue that education develops aspects of these skills too, including non-cognitive skills, through teamwork in groups, liaison with key stakeholder groups at college etc.

directly, and it can also signal the greater health and hence future productivity of participants (Lechner, 2009) ; Rooth, 2011).[5]

Likewise, in the context of social capital, Becker (1974) extends the basic allocation-of-time model to argue that an individual can invest effort in the accrual of social characteristics in order to increase the stock of an individual's wealth beyond that which yields only monetary income. The clear implication for the sporting context is that the practice of sport might also entail investment in, for example, a teamwork ethic which is then rewarded in the labour market directly (Rees and Sabia, 2010), or perhaps indirectly through access to networks of employment (Jackson, 2010). Overall, therefore, once one moves from a narrow theoretical view that participation has a time allocation opportunity cost for investment in education, sport has the potential to have positive labour market outcomes, the possibility of which is clearly captured in popular sentiments such as those espoused by the United Nations in statements such as,

> "…sport contributes to personal development and growth. It teaches us teamwork and fair play. It builds self-esteem and opens doors to new opportunities. This, in turn, can contribute to the well-being of whole communities and countries." [6]

2.2 Empirical evidence

2.2.1 Sports participation

Before engaging in empirical work, it is instructive to examine the literature that develops an understanding of the transmission mechanisms of the impact of sport on labour market outcomes. In particular this includes looking at the determinants and correlates of sports par-

[5] In this way Rooth (2009) finds that physical attractiveness, which in part is an outcome of physical activity, might improve the chances of employability, such that females might be judged more harshly when connected with obesity.

[6] http://www.unis.unvienna.org/unis/en/pressrels/2006/sgsm10323.html (accessed 13th March 2013).

ticipation *per se*. This provides an opportunity to indicate the adequacy of the set of confounding variables that can be controlled for in the current research.

The determinants of participation in sport are well understood in the literature with a comprehensive survey of contributions from economics and the social sciences in Downward *et al*, 2011). The literature has examined both the decision to participate in sport, but also the frequency and, less so, the intensity of participation. Some example references illustrate the main results.[7] Broadly speaking the literature finds that males are more likely to participate in sport than females (Downward, 2007; Breuer and Wicker, 2008) and also more frequently (Eberth and Smith, 2010). Likewise lower age broadly increases participation in sport though the frequency can increase with ageing (Lera-López and Rapún Garate, 2007; Garcìa et al. 2012). Stamatakis and Chaudhury (2008) have also found that participation rates can increase with age. Nonetheless, there is also evidence that the frequency of participation can decline with age (Humphreys and Ruseski, 2010; Eberth and Smith, 2010).

Higher incomes (Downward and Rasciute, 2010) and higher socio-economic status (Lechner, 2009) also tend to raise the participation rate and frequency of participation in sports (Humphreys and Ruseski, 2010). The same is true for levels of education being higher (Fridberg, 2010; Hovemann and Wicker, 2009). In the latter case, however, results can be mixed for the frequency of participation (Downward and Riordan, 2007). [8] The opportunity cost of time is not always directly investigated in the literature, but its effect can be implied in work status and household composition variables. For example, a variety of household characteristics appear to reduce participation in sport. These include being married or a couple and, particularly, the presence of young children in the household for females (Eberth and

[7] As multivariate studies most of these sources have relevance for each of the variables being discussed. Selected references are presented to illustrate the breadth of the literature.

[8] The opportunity cost of time is not always directly investigated but is implied in work status and household composition variables. However, Downward (2004) identifies a limited impact of work hours on participation.

Smith, 2010; Garcìa et al. 2010) and if household size increases (Downward, 2007). Nonetheless, Downward and Rasciute (2011b) also identify that households of greater numbers of adults and children are more likely to participate in sports than other leisure activities. More directly, Downward (2004) identifies a limited impact of work hours on participation and Meltzer *et al* (2010) show that the intensity of exercise increases with wage rates, which suggests that individuals economise on time for a given amount of exercise. Overall, these studies also typically show that belonging to an ethnic minority is associated with lower participation.

There is less evidence of the impacts of facility supply on sports participation, but a number of German city studies (Wicker *et al* 2009, 2012, and Hallmann *et al* 2012) identify that the availability of sport infrastructure influences patterns of sports participation and that this varies with age. Consequently the availability of swimming pools is important for young and adolescent participation, but the number of fitness centres and sports fields are more important for young adults. Downward and Rasciute (2012a) also provide evidence that satisfaction with the provision of sports facilities and the number of clubs to which individuals belong is positively related to sports participation, particularly to the intensity of female activity.

2.2.2 Health and social capital outcomes

Distinct from the economic and social science literature, the physical activity and medical literature concentrates more on the impacts of physical activity, which may include sport, on health. The evidence suggests that physical activity raises cardiovascular performance and respiratory fitness (Steyn *et* al, 2005; Sofi *et al*, 2008; Nocon *et al*, 2008); improves muscular strength, bone health and reduces cancer (Warburton *et al*, 2007, Bauman *et al*, 2005); improves metabolic health, for example by reducing Type II diabetes (Cook *et al*, 2008; Gill and Cooper, 2008) and, arguably psychological well-being by reducing depression (Chalder *et al*, 2012; Krogh *et al*, 2011; Mead *et al*, 2009; Camacho *et al*, 1991; Farmer *et al*, 1988). Similar

research which focusses on sport supports these findings (O'Donovan *et al*, 2010; Haskell *et al*, 2007).

Summary insight into the large physical activity literature is provided by Bauman *et al* (2002). This is an important contribution because it shows that the economic and social science literature reviewed above essentially focusses on specific subsets of variables that might influence physical activity, i.e. primarily socio-economic factors, as well as physical environment factors, such as access to facilities. However, many other correlates are identified in the literature including aspects of health and obesity and genetic factors; psychological, cognitive, and emotional factors; behavioural attributes associated with factors such as diet, childhood behaviour, smoking; and social and cultural factors such as family influences, and those emanating from medical advice, and social support. The implication is that the absence of these variables from the confounders in the current research reduces the legitimacy of making strong causal claims. However, this also suggests that trying to control for some of these confounding effects where possible is of much importance. In this regard, a notable difference in some of the physical activity and medical literature from that emanating from economics and social sciences is that the former also examines the impacts upon and from physical activity through the use of (quasi-) experimental designs rather than simply large scale cross-sectional or longitudinal data in regression-based studies. They directly explore particular policy interventions on physical activity behaviour. For example, Kaczynski *et al* (2008) and Coombes *et al* (2010) examine the impact of proximity to green spaces, as a natural experiment, on the observed physical activity of residents. Stamatakis *et al* (2009) examine the impact of cardiovascular medication on physical activity levels and Hughes *et al* (2009) exposure to physical activity programmes on elderly physical activity levels. In the latter case randomised trials are used to generate the statistical results.

In contrast, there is much less literature from the economics and social sciences that examines the impact of sport on health and, moreover, it does so primarily by examining subjective scales of general health as part of large-scale publicly available data explorations.[9] As noted in section 2.2, and controlling for confounding and counterfactual effects, Lechner (2009) examines the German Socio-economic Panel to identify positive impacts of sport on health, though less so for males. Rasciute and Downward (2010) use a variety of discrete choice and cardinal estimators to examine a series of cross-sections from the Taking Part Survey and indicate that in the UK participation in sports (including walking and cycling) are positively associated with a single scale subjectively defined health measure. Finally, Humphrey *et al* (2013) make use of an instrumental variable strategy in a recursive bivariate probit model examining the probability of participating in physical activity and the probability of experiencing particular health outcomes to examine Canadian Community Health Survey Data. The individual's sense of belonging to the community is used as an exclusion restriction to aid identification of the model, arguing that this measures aspects of the availability of the supply of facilities. They find that participation in physical activity reduces the incidence of diabetes, high blood pressure, heart disease, asthma, arthritis and well as the score on a general health scale.

As Downward and Rasciute (2012b) note the undeveloped social science and economic literature on the impacts of sport on social capital suggests that the impact may be weak or multifaceted.[10] For example whilst Seippel (2006) identifies that belonging to a sports association raises trust, as an indicator of social capital, and that the effects are stronger for members of another voluntary association by controlling for a limited number of confounders

[9] Such single-item scales of subjective health, however, are potentially unreliable indicators of an individual's actual health (Kyffin *et al* 2004, Department of Health, 2001).

[10] Both Coalter (2007) and Oughton and Tacon (2007) review the evidence. Space precludes details of how social capital is measured. In the larger scale studies variables such as generalised trust in society, or political commitment are employed as well as life satisfaction. The latter source also notes how sports volunteering and supporting sports teams may affect social capital.

using OLS regressions. More recently, Downward *et al* (forthcoming) use instrumental variable analysis, using attendance at sport events as an instrument for club membership, to show that this is not the case. This finding supports earlier work by Delaney and Keaney (2005) who analysed the large-scale European Social Survey (2002), the Home Office Citizenship Survey (2001) and the Time Usage Survey (2000) and found small effects between sports-club membership and some measures of social capital, but none between sports participation *per se* and social capital. This suggests that it may be the 'associational' character of individuals rather than sport which correlates with social capital measurements. The same concerns might be addressed to the sports volunteering literature which tends to suggest that both personal and community development can occur through the act of volunteering (see Downward *et al* 2005). As a result it is not surprising that Downward and Riordan (2007) identify that shared individual, i.e. social, characteristics have an independent influence on sports participation as well as the individual characteristics. This suggests that it may well be social capital that causes rather than responds to sports participation.

2.2.3 Labour market outcomes

As indicated in the introduction, the impact of sport on labour market outcomes is examined empirically in two strands of literature. The first strand explores the links between young people's sports participation, either inside or outside of their educational establishment, and educational performance, attainment and earnings. This literature focusses on exploring the impact of a single measure of sports participation

Early studies, not always using research designs with high levels of credibility, such as Long and Caudill (1991) find that both males and females who participated in intercollegiate athletics had higher graduation rates than non-participants and that males received a wage premium. Ewing (1995, 1998), moreover, argues that black and general high school athletes experience higher earnings compared to non-athletes respectively. More recently Ewing

(2007) shows that former high school athletes experienced greater fringe benefits in employment as well as wages. None of these studies, however, explicitly attempted to identify causal effects. In contrast, whilst Maloney and McCormick (1993) argue that participation in college athletics reduced scholarly success, they nonetheless recognise that the results may be due to sample selection effects, given the lower overall standardised test scores achieved by athlete entrants to high school.

Later studies have broadly tried to distinguish between such selection and causal effects using a variety of econometric strategies. Barron *et al* (2000) make use of an instrumental variable approach to identify positive impacts on the wages and educational attainment of student athletes, though they interpret the impacts as stemming from signalling the greater ability of athletes and their having less preference for leisure (indicating industriousness) rather than impacts due to human capital.[11] Their theoretical model, which is used to interpret the results, however, explicitly rules out an impact of sport on human capital through productivity enhancement, and, instead, focusses on the time-allocation consequences of sport as crowding-out education. The instruments employed in the analysis include school size, and other school characteristics, as indicators of supply opportunities, as well as the income of parents and the health, height and weight of the student. It is clear that some of these variables could be affected by sports participation, while others might have a direct effect on outcome thus leading to some doubts when interpreting the results.

In contrast, Eide and Ronan (2001) show that lower attainment was achieved for white male sport participants, but white females and black males participating in sport experienced increases in academic success. They also adopted an instrumental variable approach to their analysis, using the height of students as an instrumental variable. Intuitively this is a stronger instrument, than say health or weight, but in isolation provides a limited basis of exogenous

[11] Stevenson (2010) also discusses this possibility

information for identification of the treatment effects (and may also have, again, a direct effect on the outcomes). Lipscomb (2007) also finds general increases in educational attainment for those participating in extra-curricular school-sponsored sports. In this paper a fixed effects modelling strategy and information on the joining and quitting of clubs by individuals are used to try to control for selection effects and to identify causal effects respectively. In the latter case, it is clear that parental choice could confound the relationships between participation and club activity. Pfeifer and Cornelissen (2010) also argue that outside-school sport has a strong effect on a variety of levels of educational achievement. In this research school characteristics and city size are again used as instruments to measure the supply of sporting opportunities (again, direct effects on the outcome may be suspected). Student's height is also used to measure student propensity for sport. Rees and Sabia (2010) also use the height of a student as an instrumental variable, but argue that sports participation does not have an effect on academic performance for indicators such as grade-point averages, paying attention in class and college aspirations. However, in an analysis of female students Stevenson (2010)[12] makes use of changes in US law formalising the need for equality in male and female student sports provision, as a natural experimental shock, interacted with pre-legislative male participation in sport as instrument, in an analysis of post legislation female education and earnings. It is shown that increases in female sports participation raise female subsequent college attendance and labour force participation and wages. Finally, Felfe *et al* (2011) make use of both instrumental variables measuring distance from sports facilities, and lags to control for reverse causality, in an analysis which suggests that sports club participation enhances measures of children's cognitive and non-cognitive development. On balance, thus, the literature is suggestive of positive effects of sports participation on educational achievement and

[12] The legal change involved Title IX of the Educational Amendments to the 1964 Civil Rights Act. This banned gender discrimination in federally funded educational institutions.

earnings, but, with the exception of the latter couple of papers, it is clear that several of the econometric analyses rely on questionable instruments for identification.

The second strand of literature focusses on the potential for sport to have labour market outcomes for the wider population and has, in one case, explored the effects of different sports on the possibility of being called for interview. A very comprehensive analysis is undertaken by Lechner (2009) who uses a matching approach on panel data that has been restructured to group individuals that previously had the same sports participation behaviour in the period before analysis as part of controlling for confounding effects. It is found that sports activities have positive long-term impacts on earnings and wages (as well as on health and subjective well-being). Subsequently, Cabane (2010) parametrically analyses panel data to conclude that sports participation in the previous year has a positive association with greater job autonomy and higher wages in the next year. In this way lags are used to try to control for reverse causality. Lagged observable behaviour on characteristics such as health, education and work experiences are also used to try to control for confounding effects, with the aspiration that signalling effects are isolated from health, human capital and networking effects. Finally Rooth (2011) presents results based on a randomised field experiment that job candidates demonstrating experience of sports are more likely to be called for interview than candidates who are similar in other respects but have not participated in sport. Rooth (2011) is also the only study to investigate the impact of different sports. It is argued that soccer and golf have the greatest impacts with the implication that this is because of their signalling social rather than the health spillovers from sport. Nonetheless, in a separate analysis of secondary data associated with military enlistment, Rooth (2011) also presents (non-experimental) evidence that physical fitness is associated positively with earnings, controlling for cognitive and non-cognitive skills for siblings, thereby controlling for particular unobservable family effects.

Overall, the implication of this discussion is that this strand of literature more strongly reveals causal effects running from sports participation to labour market outcomes. The precise mechanisms through which this operates though remain more subject to (theoretical) debate. To an extent this depends upon how broadly one defines human capital, if externalities through health and social capital are recognised as possible channels of influence and, finally, how these are made manifest in the labour market through signals and networks.

The current paper, consequently, seeks to add to this literature by being the first attempt to measure the potential for labour market impacts from sport participation in the UK. Moreover, following Rooth (2011), account is taken of the heterogeneous nature of sports, but with an analysis of actual labour market outcomes, and finally, the analysis tries to account for important confounding effects (as much as the data allow).

3 Data

3.1 Data sources

The data used in the current research was produced by synthesising variables from three major surveys. The first data source is the Active People Survey (APS) which is the largest internationally available on-going database on sports participation. It is commissioned by Sport England and conducted by Ipsos MORI. The first wave of the survey (APS 1) was completed between mid-October 2005 and mid-October 2006. Initially a target of at least 1000 respondents was adopted for each local authority to generate a statistically reliable sample size at that level of disaggregation. Overall this produced a sample of 363,724 respondents in APS 1. Subsequent waves have then taken place annually and because of cost the sample size reduced to approximately 500 respondents per local authority. Consequently APS 2 was undertaken between mid-October 2007 and mid-October 2008 and has a sample size of 191,325. APS 3 took place between mid-October 2008 and mid-October 2009 and has a sample size of

193,947 and APS 4 was conducted between mid-October 2009 and mid-October 2010. This has a sample size of 188,354. The subsequent waves of the survey have taken place on the same scale as APS 2 to 4. The survey is conducted by telephone on the national sample with households identified by random digit dialling. Household respondents are then selected according to the next birthday rule.

In the current research APS 3 and APS 4 are used. APS 4 provides the core individual data for sports participation, labour market outcomes and some individual characteristics of participants APS 3 is used to contribute variables that might control for the confounding impacts of participation on labour market outcomes by providing lagged information on aspects of sports participation aggregated to local authority level. APS 4 is also used because it was matched to data on the number of sports facilities at the local authority level that was collected in the Active Places Survey (APLS) and made available to the researchers for periods up to 2008, and which also adds exogenous information to the dataset.

The APLS commenced in 2004 and is an initiative managed by Sport England. It involves cooperation of a large number of stakeholders including professional sports teams, the DCMS, local authorities and leisure service providers. Facilities that are simply pay and play, require memberships, or are sports clubs or community clubs are counted in the survey, which is estimated to capture up to 80 per cent of formal participation opportunities.[13] As a 'live' management tool there is no historic evolution of the number of facilities recorded in the data. Consequently the data is viewed as relevant over the periods since 2004 but 2008 in particular. Specifically it was possible to map the total number of facilities available in local authorities to the data on participation from the APS, which controls for the impact of the distribution of facilities on participation.

[13] http://www.activeplacespower.com/faqs/by/Data (accessed 18th March 2013).

The other major source of data was the Annual Population Survey (APopS). First conducted in 2004, the APopS combines results from the Labour Force Survey (LFS) with enhanced data on social and socio-economic variables. The survey is based on approximately 55,000 households generating approximately 360,000 respondents per dataset, and covering a target sample of at least 510 economically active respondents for each local authority. In the current research the APopS from the year corresponding to APS 3 is also used to provide variables for a variety of household composition and health and sickness variables which, when also aggregated to a local authority level, control for potential influences on sports participation that could confound outcomes. Finally, data on local authority populations was obtained from the Office for National Statistics.[14]

3.2 Sample selection

The APS measures sports participation in England for adults aged 16 years or older.[15] The APLS also covers England, whilst the APopS covers UK household members of all ages. In matching the data across the surveys and in seeking to identify the labour market outcomes of sports participation, the focus is upon respondents living in England. The specific context of England reflects the focus of the sports participation and facilities data. This generated a sample of 169,460 observations (age 16-80). Some observations were subsequently dropped for the local authorities where it was not possible to get reliable population data. Other observations were dropped for respondents classified as either having a disability or severe long-term illness. The potential lack of employability of such individuals is not the main focus of the research. Some observations were also dropped because of missing values for disability and employment status. Finally, as the analysis investigates the labour market outcomes of sport, it focusses on males and females in the age categories of 26 to 45 years of age and 46 to

[14] http://www.ons.gov.uk/ons/datasets-and-tables/index.html. APopS data are generally available at the level of Government Office Region but can be accessed at local authority level by special license, which is the case here.

[15] From July 2012, which covers the end of APS 6 and onwards the sample covers respondents aged 14 years.

64 years of age. These age groups are likely to capture individuals that have left full-time education, and also capture initial and then mature employment history. This produced a working sample size of 79,561 observations.

4 Sports participation

4.1 Aggregation of different sports

The questions investigating sport participation in the APS captures data on an extremely wide, but increasing range of activities. This reflects the survey's intent of informing and evaluating sports policy at a highly disaggregated nature. In APS 1 data were collected on 256 separate activities. Subsequent waves refined these activities into further sub divisions which led to 415 activities in APS 4.

For each activity, questions were asked about whether or not the respondent participated in the activity in the last four weeks; on how many days in the last four weeks the respondent participated in the activity; the usual length of time in minutes in which the activity is undertaken; if participating in the activity raised the respondent's breathing rate; and, if participating in the activity made the respondent out of breath or sweat. A positive response to the penultimate question identifies 'moderate' activity, and a positive response to the last question 'vigorous' activity (Ipsos Mori, 2007).

These questions along with the question probing participation or not, required a binary response. Scoring each of these variables as a '1' and '0' for 'yes' and 'no' respectively means that the product of responses to all of these questions identifies the minutes in the last four weeks in which moderate or vigorous sport was undertaken or not, or sport which does not reach either of these thresholds. In the current research the focus is upon participation that achieves at least moderate intensity, to abstract from the most casual of sporting experience.

The presumption is that for sport to have an impact on labour market outcomes, for example, through human capital acquisition, requires at least some degree of organisation and intensity.

Because of the extremely wide range of individual activities investigated in the data sports were aggregated into five main groups; team sports, keep fit activities, racquet sports leisure activities and outdoor activities. It is clear that any categorisation of sports has an element of arbitrariness associated with it. Nonetheless, in part this aggregation of activities was based on rather obvious, *a priori* features of the sports, recognising the different functions of sport to individuals and their likely organisation. For example, Downward and Riordan (2007) identified an empirical classification of sports in the UK associated with teams, fitness activities, and leisure activities. This echoed earlier distinctions drawn between sport, recreation and leisure as proposed by Rodgers (1977, 1978) in which sport is viewed primarily as an organised competitive activity, recreation as self-organised individual fitness activity, and leisure as informal and primarily social activity. These distinctions, particularly between team and fitness sports, have also proved to have relevance in assessing the well-being of sports participants in the UK. Downward and Rasciute (2011) show that activities such as team or group sports yielded additional value to individuals because of their social interactions. This is a function of sport which is also identified by Rooth (2011), as noted above.

Consequently, in the current research team sports were defined to include activities such as versions of football, cricket, rugby, netball, basketball etc.; keep fit activities were defined to include individual sport and fitness activities like field and track athletic activities, cycling, martial arts, weight training and lifting, that would typically take place in fitness or leisure centres and clubs; racquet sports such as badminton, tennis, and squash were included as a separate category because, whilst they are offered at fitness centres there are also distinct clubs and leisure outlets that cater for them and they inevitably take place in the context of groups; leisure activities were defined to include versions of swimming, bowling and dancing

etc. In this respect, whilst the latter included gymnastic and trampolining activities, which might suggest they are better characterised as fitness activities, account needs to be taken of the fact that activities such as trampolining most often take place in the garden informally as indicated in the data, and that dancing also includes activities such as cheerleading.

The final category of outdoor activities is perhaps the most eclectic. This included elements of outdoor pursuits such as hunting, horse riding and hill walking; as well as motor sports involving cars and bikes, and winter sports such as skiing and bobsleighing; and water sports such as canoeing and some leisure activities like golfing. These activities were included separately to recognise their distinctiveness from purely leisure pursuits, fitness activities and team sports but also to recognise their connection with lifestyle, possible vacation activity, and their typically longer duration either intrinsically or connected with tourism as well as their requirement for equipment. Whilst these categories might be challenged, nonetheless their role in the analysis is made more transparent in the next section, which highlights the extent to which individual activities dominate the behaviour of the groups, and thus of which they might represent.

4.2 Descriptive analysis of sports participation

4.2.1 Participation shares in different age-gender cohorts

In this section a description of how participation in sports activities is distributed over the gender and age categories is presented. Table 1 shows participation shares for the higher and lower intensity activities in the full sample, as well as the participation rates for higher intensity activities in the respective subsamples. The main activities that empirically underpin the behaviour in the Team, Fitness, Racquet, Outdoor and Leisure sports are also presented.[16]

[16] Activities with participation rates below 1% for all subsamples are omitted. See Table IA.X.1 in the internet appendix for a complete set of results.

Table 1: Sports activities in the full sample (shares in %)

	Participation rates in activities of higher intensity					… of low intensity
Subsample	All	Men		Women		All
Type of sport		26-45	46-64	26-45	46-64	
All	43.7	54.7	36.6	41.2	31.9	13.5
Team	11.2	19.4	5.5	2.7	0.9	1.6
Fitness	24.9	30.6	17.5	29.1	20.5	3.8
Racquet	5.7	7.9	6.5	3.8	3.7	0.7
Outdoor	6.4	8.4	10.2	3.2	3.5	1.0
Leisure	9.5	9.1	6.4	13.0	9.5	7.3
Football	8.5	16.1	4.0	0.9	0.2	0.9
Rugby	1.1	1.5	0.4	0.1	0.0	0.1
Netball	0.7	0.3	0.1	1.2	0.2	0.1
Basketball	0.7	0.5	0.1	0.1	0.1	0.1
Cricket	0.6	1.1	0.7	0.1	0.0	0.5
Hockey	0.5	0.4	0.2	0.2	0.2	0.0
Baseball	0.3	0.3	0.1	0.2	0.1	0.0
Fitness Indoor	16.5	17.7	10.9	20.7	16.7	2.5
Running	8.2	12.9	6.1	9.3	3.2	0.0
Combat	1.5	2.5	0.8	1.0	0.2	0.1
Bodybuilding	1.1	2.5	0.9	0.4	0.2	0.4
Asian sports	1.1	0.4	0.3	2.3	2.1	0.6
Athletics	0.4	0.3	0.2	0.3	0.1	0.1
Badminton	3.9	6.0	4.7	2.3	2.1	0.4
Tennis	2.1	2.4	2.2	1.6	1.7	0.3
Golf	3.7	5.0	8.1	0.4	1.5	0.0
Outdoor act.	1.3	2.4	1.3	0.8	0.5	0.2
Horse riding	0.8	0.1	0.1	1.5	1.1	0.4
Swimming	8.7	8.7	6.0	12.2	8.7	6.1
Gymn., dancing	0.6	0.1	0.1	0.8	0.7	0.2
Bowling	0.4	0.2	0.4	0.1	0.3	1.1

Note: *Intensity high*: Only sports with moderate or rigorous intensity. *Intensity low*: Any participation in this type of sports that is not intensive enough to be classified as *high intensity*. Ice hockey, cycling, rowing, hunting, motor sports, skiing and bob sleighing are omitted from this table, because the participation rates are below 1% for all groups. The category 'all' includes all individuals not older than 80. Sample weights used.

The results show that with the exception of leisure sports, most sporting activity takes place at moderate or vigorous intensity for these age cohorts. Just over 40% of this population performs at least some sports related activities of this degree of intensity. However, the results show that the activity levels are highly age and gender specific. As expected, following the discussions of the literature, the older individuals become the lower their general activity levels. Likewise with respect to gender a generally higher activity level for males compared to females is noted, but this difference declines with age.

Consideration of the broad categories of sport also reveals the importance of allowing for an analysis of the heterogeneity of sporting experience (and implicitly that this is also

linked to the variety of activities that are grouped). While team sports are important for males and, in particular young males, their role for females is considerably smaller. In contrast, leisure sports are generally more likely to have female participants. Overall it appears that participation in fitness, racquet, outdoor and leisure activities can carry through more easily into middle age, compared to team sports. Moreover, female participation in fitness activities can come to exceed that of males in middle age.

These results accord with expectations from the literature not only with respect to ageing and gender, but that organised competitive activity traditionally takes place in male team sports; that fitness activities can be undertaken for middle aged participants, with perhaps less time available to them and whose physique is less able to cope with competitive sport; whilst more casual leisure activity can persist more easily over the life course. The disaggregation reveals that football, indoor fitness activities, including badminton but also tennis, swimming and golf are the main drivers of behaviour in the team, fitness, racquet, outdoor and leisure groups. These results accord with the literature (Downward *et al* 2009).

4.2.2 Probit analysis of participation in different sports groups

Although the age-gender gradient of the single activities is obvious from the results shown above, this section reports how the participation rates relate to other 'exogenous' factors, i.e. factors that are not directly affected by the individual sports activities but which can influence them. For this analysis, a constraint is the limited information on individual characteristics collected by the APS. Nonetheless, as described above, exploitation is possible of previous cross-sections of the APS as well as the APopS to impute features of the Local Authorities in which individuals reside. Consequently, age, gender, education, ethnicity and number of children in the household from the APS and contemporaneous to participation at the individual level is used. Local authority level versions of these characteristics for individuals are then identified for the previous year from the APS along with average house-

hold and labour market and health indicators from the APopS from the previous year. Population data on local authorities identified from the ONS is also used. Finally the numbers of local authority sports facilities are obtained from the APLS. In the light of the discussion of Section 2.2 this suggests that socio-economic factors, as well as physical environment factors, such as access to facilities as well as correlates relating to health and family composition are controlled for. In contrast potentially absent factors might relate to different aspects of health and obesity than those measured and genetic factors; psychological, cognitive and emotional factors; and behavioural attributes associated with factors such as diet, childhood behaviour, and smoking as well as those emanating from medical advice and social support.

For brevity of presentation, Table 2 presents average marginal effects for any type of sports participation collectively or distinctly against no participation, whilst Table 3 for comparisons of types of sport. The average marginal effects are shown for selected individual characteristics, with full results in the appendices (Table A.2), for the case of any type of sport against no participation. In general the results are consistent with the literature on overall sports participation but also reveal important heterogeneities with respect to sports' type.

Consequently, for males, increasing age is generally associated with a lower propensity to participate, with the exception of leisure sports, which is driven by swimming. This is also the case for females, with the exception of fitness sports and outdoor sports (such as golf). In both the male and female cases, and across sports, white ethnicity is associated with an increased propensity to participate. Across all sports, males with a degree or higher education have a greater propensity to participate, except for outdoor sport, whereas it tends to be degree-level study that is of importance for younger females, with the exception of team sports. Finally, Table 2 indicates that the presence of children in the household is most likely to reduce the incidence of participation for younger females but, as with males of middle age, then increase participation as they age.

Table 2: Average marginal effects for participation in specific activities of higher intensity

	Average effects (in %-points)			
Subsample	Men		Women	
Variables	26-45	46-64	26-45	46-64
	Team or fitness or outdoor or leisure vs. no sports			
Number of children in household	0.8	*2.1*	*-2.9*	*2.0*
Ethnicity white	*13.8*	2.1	*13.1*	*11.8*
Age	*-0.8*	*-1.1*	-0.2	*-0.45*
Education: Degree or equivalent	*9.6*	*11.9*	*9.6*	*11.8*
Higher education	*4.9*	*8.7*	2.3	*6.2*
GCSE	*-2.4*	*-4.6*	*-8.1*	-3.2
Other education	*-13.9*	*-9.1*	*-17.7*	*-11.2*
	Team vs. no sports			
Number of children in household	*3.2*	*2.1*	-0.1	0.4
Ethnicity white	*11.5*	1.2	*2.6*	0.7
Age	*-1.5*	*-0.8*	*-0.2*	-0.0
Education: Degree or equivalent	4.2	2.4	*2.2*	0.2
Higher education	*3.9*	1.7	*2.5*	0.4
GCSE	-1.2	-1.5	0.3	*-0.7*
Other education	*-10.0*	-2.1	*-2.7*	*-0.9*
	Fitness vs. no sports			
Number of children in household	-0.7	1.0	*-3.5*	0.8
Ethnicity white	*10.5*	-1.5	*10.9*	*8.2*
Age	*-0.8*	*-1.0*	-0.2	*-0.5*
Education: Degree or equivalent	*11.6*	*14.5*	9.4	*11.0*
Higher education	4.5	*8.8*	1.2	*6.4*
GCSE	-3.3	-2.3	*-7.2*	-2.6
Other education	*-14.9*	*-6.1*	*-17.9*	*-9.1*
	Racquet vs. no sports			
Number of children in household	-0.1	1.1	*-1.3*	*1.5*
Ethnicity white	*5.3*	0.8	*2.6*	*3.1*
Age	*-0.3*	*-0.3*	*0.2*	*-0.1*
Education: Degree or equivalent	*9.9*	*6.3*	*3.2*	*4.3*
Higher education	*6.9*	*4.2*	0.6	2.4
GCSE	-1.1	*-2.1*	*-2.5*	-0.9
Other education	*-6.1*	*-4.5*	*-2.9*	*-2.9*
	Outdoor vs. no sports			
Number of children in household	0.3	0.2	*-1.4*	-0.2
Ethnicity white	*14.8*	*9.0*	*4.7*	*3.4*
Age	-0.2	*-0.2*	-0.1	*-0.1*
Education: Degree or equivalent	*4.5*	2.5	*3.2*	*3.4*
Higher education	1.8	3.2	0.9	*1.4*
GCSE	-2.0	*-2.6*	-1.3	-0.5
Other education	*-5.2*	*-4.2*	-1.8	*-2.7*
	Leisure vs. no sports			
Number of children in household	*1.7*	*1.5*	-0.2	*1.8*
Ethnicity white	*9.1*	2.6	*10.8*	*6.4*
Age	-0.1	*-0.3*	-0.2	*-0.2*
Education: Degree or equivalent	*9.4*	*4.6*	*6.3*	*5.4*
Higher education	*6.1*	2.9	1.4	1.5
GCSE	-0.8	-1.6	*-7.1*	*-1.9*
Other education	*-8.8*	*-2.9*	*-9.3*	*-4.6*

Note: Same control variables used as in Table A.2 shown in the appendix. Average effects are computed as the weighted sample mean of the individual marginal effects. In case of a dummy variable the discrete effect of changing the respective variable from 0 to 1 is computed instead of the marginal effect. Inference is based on estimating the standard error by 1999 bootstrap replications taking clustering on the local authority level into account. The reference group for education is A-level. ***Bold italics***: Coefficient is significant at 1% level; **Bold**: Coefficient is significant at 5% level; *Italics:* Coefficient is significant at 10% level.

Table 3: Average marginal effects for participation in specific activities of higher intensity

	Average effects (in %-points)			
Subsample	Men		Women	
Variables	26-45	46-64	26-45	46-64
	Team vs. fitness			
Number of children in household	*5.6*	*4.5*	*1.3*	*1.3*
Ethnicity white	2.1	5.0	0.6	0.1
Age	*-1.2*	*-0.8*	*-0.2*	0.1
Education: Degree or equivalent	*-9.8*	*-11.0*	-0.3	-0.1
Higher education	-0.5	-4.6	2.5	0.1
GCSE	2.1	-1.6	3.1	-0.1
Other education	5.2	0.8	1.5	-0.8
	Team vs. racquet			
Number of children in household	*4.8*	*4.8*	*5.5*	0.7
Ethnicity white	-0.4	2.3	2.8	3.8
Age	*-1.4*	*-1.8*	*-2.9*	-0.1
Education: Degree or equivalent	*-13.0*	*-11.2*	-1.3	-9.0
Higher education	*-5.5*	-6.3	8.7	-3.7
GCSE	0.7	1.6	12.1	-4.5
Other education	2.4	10.2	-1.8	-2.3
	Team vs. outdoor			
Number of children in household	*3.5*	*6.2*	*6.1*	6.0
Ethnicity white	*-17.1*	*-26.8*	*-23.5*	-16.7
Age	*-1.5*	*-2.0*	*-1.2*	0.2
Education: Degree or equivalent	-1.2	4.8	-6.7	-6.1
Higher education	2.2	1.2	3.5	1.8
GCSE	3.3	1.0	4.7	-6.4
Other education	-2.4	3.2	*-17.4*	-3.9
	Team vs. leisure			
Number of children in household	1.9	*3.3*	-0.6	0.9
Ethnicity white	-3.4	-6.2	-2.6	-2.1
Age	*-1.9*	*-2.0*	*-0.6*	0.1
Education: Degree or equivalent	*-10.1*	-5.0	1.4	-0.9
Higher education	-4.2	-1.6	*5.6*	-0.3
GCSE	0.5	1.6	*10.1*	-1.8
Other education	*7.5*	2.3	-1.2	-2.8
	Outdoor vs. fitness			
Number of children in household	0.9	-1.2	*-1.1*	-1.3
Ethnicity white	*12.9*	*22.7*	*5.2*	*5.2*
Age	*0.4*	*1.2*	0.1	0.1
Education: Degree or equivalent	*-4.4*	*-17.6*	-0.1	-0.7
Higher education	-2.1	-7.6	0.9	-1.4
GCSE	0.2	-1.8	0.7	0.7
Other education	4.3	0.7	4.8	-1.6
	Outdoor vs. racquet			
Number of children in household	1.4	*-3.4*	-1.7	*-10.6*
Ethnicity white	*31.7*	*28.9*	*29.3*	14.0
Age	0.3	*0.7*	*-0.7*	*-0.6*
Education: Degree or equivalent	*-13.5*	*-14.5*	*7.2*	-3.2
Higher education	-10.1	-6.6	4.3	-4.4
GCSE	-3.4	0.9	*9.3*	1.4
Other education	2.2	6.3	13.8	2.2

Table to be continued

Table 3: continued

Subsample / Variables	Average effects (in %-points) Men 26-45	Men 46-64	Women 26-45	Women 46-64
	Fitness vs. leisure			
Number of children in household	*-2.5*	-2.8	*-4.1*	*-3.9*
Ethnicity white	-2.7	-8.6	*-5.1*	-2.5
Age	*-0.5*	*-0.8*	-0.1	*-0.4*
Education: Degree or equivalent	-2.0	*8.2*	2.2	**5.5**
Higher education	-2.8	3.9	-0.4	3.2
GCSE	-1.9	1.2	*3.4*	0.7
Other education	2.5	0.1	-6.8	-3.2
	Racquet vs. leisure			
Number of children in household	*-3.6*	-1.8	*-4.2*	*2.9*
Ethnicity white	**-9.4**	-7.9	-5.3	1.0
Age	-0.6	-0.2	*0.7*	0.1
Education: Degree or equivalent	3.0	*6.4*	2.6	**7.9**
Higher education	3.3	5.5	1.0	4.0
GCSE	0.2	0.1	2.6	1.2
Other education	8.1	-6.7	5.5	-4.9
	Fitness vs. racquet			
Number of children in household	-0.6	-0.7	0.1	*-3.2*
Ethnicity white	1.9	-4.5	1.1	*-4.6*
Age	*-0.2*	*-0.6*	*-0.3*	*-0.3*
Education: Degree or equivalent	*-3.0*	**5.3**	-0.2	-1.7
Higher education	*-5.3*	1.0	-0.3	-0.3
GCSE	-0.8	3.7	1.6	0.6
Other education	-2.8	6.0	2.2	2.5
	Outdoor vs. leisure			
Number of children in household	**-2.3**	*-5.0*	*-4.8*	*-4.6*
Ethnicity white	*25.7*	**22.1**	*10.5*	8.5
Age	-0.2	0.4	0.2	-0.2
Education: Degree or equivalent	*-9.8*	-7.7	*3.8*	3.9
Higher education	*-7.7*	-2.3	-0.1	-1.5
GCSE	-3.4	0.3	5.0	2.7
Other education	9.6	-0.3	12.1	-4.8

Note: Same control variables used as in Table A.2 shown in the appendix. Average effects are computed as the weighted sample mean of the individual marginal effects. In case of a dummy variable the discrete effect of changing the respective variable from 0 to 1 is computed instead of the marginal effect. Inference is based on estimating the standard error by 1999 bootstrap replications taking clustering on the local authority level into account. The reference group for education is A-level. ***Bold italics***: Coefficient is significant at 1% level; **Bold**: Coefficient is significant at 5% level; *Italics:* Coefficient is significant at 10% level.

Table 3 reveals that the number of children in the household is primarily associated with more incidence of team sport participation over other forms of sport for males, but also younger females. In contrast, the number of children is associated with less participation for leisure sports than for other sports; which suggests that some structure helps to facilitate family activity. There is also evidence that increasing age is associated with greater outdoor activities than fitness and racquet sports. In contrast younger females are more associated with racquet sports than fitness activities and older females more associated with fitness activities

than leisure sports. In contrast for males substitution away from team sports for any age group with ageing is most pronounced.

More important than the specific relationships highlighted here, however, is the fact that the results indicate a need to account for their impact on sports participation in seeking to explore the effect of sport on labour market outcomes.

5 Sports participation and labour market outcomes

5.1 Matching approach

The analysis above describes the participation patterns of sports activities and how they are related to individual and local authority level factors that can be thought of, at least in the short-run, as not being influenced by participation in the different types of sports considered. In this section, an analysis is provided of how labour market outcomes might be influenced by participation in the different types of sports activities but keeping the distribution of the 'exogenous' variables described above constant.[17]

The estimator used for this purpose is a matching estimator. Matching estimators are particularly attractive when analysing the impact of discrete variables of interest, like the sports participation variables in this context, on outcomes. Matching estimators can be thought of as semi-parametric generalisations of linear or non-linear regression estimators. They obtain estimates whilst allowing for the heterogeneity of individual effects and with no need to impose tight functional form restrictions as with parametric models.

For example, in case of a binary variable of interest, like participating in a particular sport or type of sport, matching estimators ensure measurement, for example, of income dif-

[17] The variables used in this section as part of the so-called propensity score used in the estimator are the ones presented in the table of the previous section plus additional controls to achieve a more flexible specification. These controls include further facility variables, further indicators of regional economic performance, as well as a squared age term.

ferences for participants and non-participants that have the same distribution of covariates. The current matching estimator draws from the large scale comparison of matching estimators in Huber, Lechner, and Wunsch (2013) and, in particular, is a version of propensity-score radius matching with regression adjustment, as suggested by Lechner, Miquel, and Wunsch (2011). This has been shown to deliver robust results with high precision.[18] Under the condition that all variables that jointly influence (confound) the outcome variables as well as the participation variables are included in the matching exercise, the resulting effect would have a causal interpretation. However, as discussed in the previous section, it is clear that some potential confounding effects are not measured in the data. Therefore, strong causal claims are not made. Nevertheless, the matching estimator is well suited to investigate the relation of the outcome variables to participation, while keeping constant the 'exogenous' confounding factors that can be identified. By doing so, the sports-outcome relations of many confounding elements are controlled for and at least the analysis moves towards a causal analysis from one of simply association. Controlling for the impact of counterfactual influences on these outcomes is a natural feature of matching estimators.

Based on the available outcome variables in APS, an estimate of the relationship between the different types of sports participation noted above on various labour market outcomes such as individual incomes and on whether the individual is working, unemployed, or retired is undertaken.

[18] See also Huber, Lechner and Steinmayr (2012) for operational details of this estimator. The particular version of this estimator used is the RAD_MATCH Gauss package version 3.1.1. It has the feature that sampling weights are accounted for in general. Furthermore, bootstrap inference as described in Huber, Lechner and Steinmayr (2012) is based on weights that are combination of sampling weights, matching weights as well as regression weights. Furthermore, the improved bootstrap smoother as proposed by Racine and MacKinnon (2007) is used to economise on the required bootstrap replications. In addition, the variable *degree* and the sample weight are used as additional variables in the Mahalanobis step, in which the propensity score is overweighed by a factor of 5. The distance measure is set to 150%.

5.2 Results

Table 4 contains the results of the comparisons of the different types of sports with not participating in any of them, while Table 5 presents the results for a direct comparison between the different types of sports.[19]

Table 4: Conditionals associations of sport activities and labour market variables – the comparison to being non-active

	Average effects			
Subsample	Men		Women	
Variables	26-45	46-64	26-45	46-64
	Team or fitness or outdoor or leisure vs. no sports			
Household income (annual, in GBP)	*4917*	*4326*	*4014*	*2998*
Employment (in %)	*3.8*	0.5	*5.2*	0.8
Unemployment (in %)	-2.8	*-2.3*	*-1.5*	-0.6
Retirement (in %)	0.0	2.4	-0.1	*2.1*
	Team vs. no sports			
Household income (annual, in GBP)	*4292*	*2575*	*4562*	2171
Employment (in %)	*3.9*	2.7	3.0	5.4
Unemployment (in %)	*-3.5*	1.9	-1.8	4.1
Retirement (in %)	-0.1	-0.8	-0.1	-3.9
	Fitness vs. no sports			
Household income (annual, in GBP)	*6215*	*4635*	*3883*	*2986*
Employment (in %)	*4.1*	-0.1	*4.6*	-0.3
Unemployment (in %)	*-2.9*	*-2.6*	*-1.1*	-0.9
Retirement (in %)	-0.1	*3.2*	0.0	1.3
	Racquet vs. no sports			
Household income (annual, in GBP)	*5836*	*3807*	*5280*	*2871*
Employment (in %)	*4.9*	1.6	6.5	*-3.8*
Unemployment (in %)	*-3.6*	*-4.2*	-3.1	1.6
Retirement (in %)	*-0.1*	*3.5*	0.0	1.2
	Outdoor vs. no sports			
Household income (annual, in GBP)	*6528*	*5355*	*3402*	*5508*
Employment (in %)	3.7	0.6	-1.4	-3.0
Unemployment (in %)	-4.3	*-3.5*	-0.8	-0.2
Retirement (in %)	0.0	*3.6*	-0.1	5.0
	Leisure vs. no sports			
Household income (annual, in GBP)	*4456*	*4611*	*3393*	*2151*
Employment (in %)	*5.5*	1.5	*4.3*	0.6
Unemployment (in %)	*-4.3*	-2.7	-1.2	-0.9
Retirement (in %)	*-0.1*	2.0	0.0	2.7

Note: Inference: 999 bootstrap replications; bootstrapping p-values, smoothed version, linear bias adjustment, symmetric p-values used. ***Bold italics***: Variable is significant at 1% level; **Bold**: Variable is significant at 5% level; *Italics:* Variable is significant at 10% level.

Table 4 shows that most types of sports participation have positive associations with the individual income of working age males and females and, likewise, on the likelihood of

[19] To relate these effect estimates to the appropriate levels of the outcome variables, refer to Table A.1 in the appendix.

working for both sexes for those aged 26 to 45 years of age. In the former case team sports are not associated with higher earnings for older females, and in the latter case, outdoor sports not with the chance of employment. This is evidence of the possibility that sports participation enhances labour market outcomes. These results are strongly echoed in the negative associations of sports participation with unemployment for males of all ages, with the exception of team sports for younger males. The latter result is likely to represent less incidence of the practice of team sports at older ages. There is much less statistically significant evidence of effects on unemployment for females. This only appears in the case of racquet sports. Finally, and consistent with these results, participation in sports is more likely to be associated with a greater chance of being retired for males generally, with the exception of team sports, but only fitness sports for females.

Overall the results of the comparisons of participation in one of the sports compared to nonparticipation suggest that sports participation is associated with earnings increases for males and females of all ages of more than 10%, and greater chances of employment for younger males and females. For males particularly, and to a much lesser extent for females, sports participation is also associated with a general reduction in the chance of unemployment, which for the younger cohort is commensurate with a larger employment rate, while for the older cohort it goes together with an increased share of people in retirement. These results are fairly similar across different sports, despite the different kind of participants (as discussed in section 4).

Table 5: Conditionals associations of sport activities and labour market variables – the comparison to being non-active

	Average effects			
Subsample	Men		Women	
Variables	26-45	46-64	26-45	46-64
	Team vs. fitness			
Household income (annual, in GBP)	*-2168*	*-2397*	-42	-1374
Employment (in %)	-0.3	*5.2*	4.6	2.9
Unemployment (in %)	-0.8	-0.8	-1.0	4.2
Retirement (in %)	0.0	*-4.3*	0.0	-2.5
	Team vs. racquet			
Household income (annual, in GBP)	-1308	506	14	1880
Employment (in %)	2.9	2.0	4.6	*13.8*
Unemployment (in %)	-3.6	0.8	-0.4	1.0
Retirement (in %)	0.0	*1.1*	0.0	*-5.4*
	Team vs. outdoor			
Household income (annual, in GBP)	-376[b]	-2141	361	-1189
Employment (in %)	1.1[b]	3.9	5.0	*16.1*
Unemployment (in %)	0.1[b]	-0.2	0.2	-1.0
Retirement (in %)	-0.1[b]	-3.6	0.0	*-10.1*
	Team vs. leisure			
Household income (annual, in GBP)	978	247	1445	-253
Employment (in %)	1.3	2.8	3.9	*7.3*
Unemployment (in %)	0.4	-0.2	-1.8	4.0
Retirement (in %)	0.0	*-3.4*	-0.1	-7.4
	Outdoor vs. fitness			
Household income (annual, in GBP)	-654	484	-1873	*3677*
Employment (in %)	-1.1	-0.2	-7.5	-3.3
Unemployment (in %)	*-1.1*	-0.8	-0.3	2.1
Retirement (in %)	0.1	1.2	0.0	0.6
	Outdoor vs. racquet			
Household income (annual, in GBP)	1261	1711	-570	2857
Employment (in %)	1.5	*-2.1*	-3.4	1.1
Unemployment (in %)	-1.9	0.7	0.8	0.8
Retirement (in %)	0.1	1.4	0.0	2.1
	Fitness vs. leisure			
Household income (annual, in GBP)	*3567*	1121	1330	1128
Employment (in %)	1.2	0.0	0.7	0.4
Unemployment (in %)	0.6	0.0	-0.2	0.0
Retirement (in %)	0.0	-0.5	-0.1	-1.4
	Racquet vs. leisure			
Household income (annual, in GBP)	984	345	1313	1072
Employment (in %)	-0.9	*3.0*	0.3	*-5.7*
Unemployment (in %)	0.9	-2.3	-1.1	4.4
Retirement (in %)	0.0	-0.8	-0.1	-1.7
	Fitness vs. racquet			
Household income (annual, in GBP)	1491	906	135	-126
Employment (in %)	1.7	*-2.6*	-0.8	4.0
Unemployment (in %)	-0.2	*1.0*	*2.4*	-1.8
Retirement (in %)	0.0	1.2	0.0	1.8
	Outdoor vs. leisure			
Household income (annual, in GBP)	2427	1448	412	*4038*
Employment (in %)	-0.2	-1.1	-4.0	-4.6
Unemployment (in %)	-0.3	-0.1	0.2	2.0
Retirement (in %)	0.1	1.1	-0.1	2.3

Note: Inference: 999 bootstrap replications; bootstrapping p-values, smoothed version, linear bias adjustment, symmetric p-values used. ***Bold italics***: Variable is significant at 1% level; **Bold**: Variable is significant at 5% level; *Italics:* Variable is significant at 10% level.

Each of these associations is based on a comparison of undertaking a different type of sport relative to none at all. Comparing the impact of different types of sports against each other reveals greater heterogeneity in the labour market outcomes from sports participation. For males, moving away from team sports to fitness sports for younger males and towards outdoor sports for older males is associated with earnings increases. Increases are also associated here with moves from racquet sports and, for younger males, from leisure sports to fitness and outdoor activities. In contrast, for the older age group, movements towards team sports from fitness and outdoor activities are associated with greater chances of employment (and reduced retirement and sometimes reduced earnings). This would suggest some distinction in emphasis between access to work and then earnings. For females the primary impact appears to be a greater association with higher earnings for older ages in switching towards outdoor activities, or towards fitness activities from leisure activities for younger females, which is the same for younger males. However, in contrast to males, movements from outdoor or racquet sports to team sports are associated with a higher chance of employment for older females. This could signal that the effects of sport on either human, health or social capital that is typically accrued by younger males in their traditional patterns of participation, needs to be compensated for by females later in their working life.

Overall the results suggest that team sports can contribute somewhat more to employability but that this varies by age across the genders, and that outdoor activities contribute most to income when sports are directly compared. Broadly in line with Rooth (2011) it may well be that golf is important in this regard, which fits the stylised fact of it being an arena for business. It seems likely to be the case that because these activities are associated more with the younger and middle ages they are structurally connected to initial access to employment and then higher income opportunities with ageing that are associated with a career ladder. However, these vary between the genders. Clearly, these life course effects are worthy of future research.

6 Conclusion

Leisure time sport is now widely discussed in government policy and particularly in connection with its potential impact on social welfare and the health of a nation's citizens. In contrast, the role that sport plays in the development of human, health and social capital that then becomes manifest in labour market outcomes, with the related economic benefits to society, is much less researched. This lack of knowledge is also true for UK which provides the data base for this research. This paper provides new insights into the human capital impacts of sports participation, recognising that its effects could be mediated through related health and social capital impacts, by signalling higher potential individual productivity and perhaps related to team work and networking. A further important innovation and novel feature of this paper is that it investigates these impacts for different types of sports.

The analysis is undertaken based on a unique composite dataset drawing upon three major surveys and supplemented by official statistics on population. A matching estimator is employed, in which several of the important confounding factors connected with sports participation and labour market outcomes are controlled for. In particular those that emanate from social economic characteristics and sports' facilities. Several of the more detailed health and psychological, health and social factors are controlled for at the aggregated level of the local authorities. The results are also disaggregated to examine both males and females, and those aged between 26 to 45 years and those aged 46 to 64 years.

The results indicate large positive associations of sports participation with earnings, which appear to be largest for fitness and outdoor sports. Furthermore, there is a negative relation to unemployment, particularly for men. Interestingly, this reduction goes together with higher employment rates for younger men and higher retirement rates for older men. Comparing the different sports against each other reveals that team sports can contribute most to employability, perhaps by signalling teamwork, but that this varies by age across the genders,

such that older females might need to accrue these skills; and that outdoor activities contribute most to income when sports are directly compared. There appears to be, therefore, a link between sports participation and the structure of the labour market connected to initial access to employment and then higher income opportunities with ageing that are associated with a career ladder. However, these vary between the genders. These effects and differences need to be further researched.

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Appendix: Further descriptive statistics

Table A.1 shows the descriptive statistics for the variables used in the estimation.

Table A.1: Descriptive statistics for selected variables

	Weighed sample means			
Subsample	Men		Women	
Variables	26-45	46-64	26-45	46-64
	Individual characteristics			
Number of children in household (x 100)	90	34	121	24
Ethnicity white in %	84	94	83	94
Age in years	36	54	36	54
Education (in %):Degree or equivalent	44	33	43	28
Higher education	10	11	9	10
A level	17	16	19	14
GCSE	21	22	23	29
Other education	5	15	4	15
	Regions (in %)			
London	20	14	20	13
Northeast	3	3	3	4
Northwest	12	12	12	13
Yorkshire	10	11	10	11
West Midlands	10	10	10	10
East Midlands	9	10	9	10
East England	11	12	11	12
Southwest England	8	9	8	10
Southeast England	16	18	17	18
	Regional characteristics of local authorities			
LA with largest city 100k-250k	18	16	18	17
LA with largest city below 100k	50	60	51	61
Average numbers of … per head in %				
Children age 0 to 2	7.1	6.7	7.0	6.7
Long term unemployed	2.0	1.9	2.0	1.9
White ethnicity	86	89	87	90
University degree	32	30	32	30
Log of population in LA	5.2	5.1	5.2	4.9
Average numbers of … per heads in %				
Illness: Muscular Skeletal	10	10	10	10
Mental anxiety	2.7	2.7	2.7	2.7
Sickness	0.4	0.3	0.3	0.3
# of facilities in LA: Athletic tracks	1.2	1.2	1.2	1.1
Golf courses	9.2	10	9.4	10
Grass pitches	208	211	209	209
Fitness suites	28	26	27	25
Indoor bowls	1.0	1.1	1.0	1.1
Indoor tennis centers	1.3	1.2	1.3	1.2
Sports halls	38	36	38	35
Swimming pools	18	17	18	17
	Outcome variables			
Annual household income (in GBP)	32423	30432	27459	23830
Working (in %)	92	86	76	73
Unemployed (in %)	5.2	4.7	5.8	4.0
Student (in %)	1.9	0.2	3.5	0.4
Retired (in %)	0.1	8.3	0.0	16
Number of observations	15648	16658	24192	23063

Note: Weighted means using the sampling weights.

Table A.2 contains the full set of estimates for the marginal effects of the probit estimation of any sports (of moderate or vigorous) intensity vs. no such activity.

Table A.2: Average marginal effects for participation in any activity of higher intensity

	Average effects (in %-points)			
Subsample	Men		Women	
Variables	26-45	46-64	26-45	46-64
	Individual characteristics			
Number of children in household	1	*2*	*-3*	*2*
Ethnicity white	*14*	2	*13*	*12*
Age	*-.8*	*-1*	-.2	*-.5*
Education: Degree or equivalent	*10*	*12*	10	*12*
Higher education	*5*	*9*	2	*6*
GCSE	*-2*	*-5*	*-8*	-3
Other education	*-14*	*-9*	*-18*	*-11*
	Regions			
Northeast	10	-5	6	-4
Northwest	7	-7	3	-2
Yorkshire	3	*-6*	1	3
West Midlands	5	*-9*	5	-1
East Midlands	5	*-7*	4	1
East England	*6*	*-5*	5	1
Southwest England	5	-7	6	1
Southeast England	*6*	-4	4	0
	Regional characteristics of local authorities0			
LA with largest city 100k-250k	-3	0	-3	-2
LA with largest city below 100k	-2	-2	-2	0
Average numbers of … per head				
Children age 0 to 2	-18	-23	-45	*-49*
Long term unemployed	19	-60	23	-3
White ethnicity	107	11	*20*	5
University degree	*332*	-18	*36*	16
Log of population in LA	9	4	2	1
Average numbers of … per heads				
Illness: Muscular Skeletal	-290	-34	-2	-23
Mental anxiety	54	-97	-31	-5
Sickness	-52	-165	66	-138
# of facilities in LA: Athletic tracks	207	14	54	17
Golf courses	191	4	12	10
Grass pitches	-20	1	1	-1
Fitness suites	6	-6	-7	2
Indoor bowls	-48	-66	-15	-116
Indoor tennis centers	81	130	25	-24
Sports halls	-5	-2	-24	9
Swimming pools	-11	-5	-2	20
Efron's pseudo-R^2 in %	4.0	5.5	5.6	4.6

Note: Average effects are computed as the weighted sample mean of the individual marginal effects. In case of dummy variables the average individual effects of changing the variable from 0 to 1 is used instead of the marginal effect. Inference is based on estimating the standard error by 1999 bootstrap replications taking clustering on the local authority level into account. Further control variables not mentioned in this table are constant term and sampling weight. Reference group for education is A-level, for the regional dummies it is London, for size of the city it is cities larger than 250'000 inhabitants. ***Bold italics***: Coefficient is significant at 1% level; **Bold**: Coefficient is significant at 5% level; *Italics:* Coefficient is significant at 10% level.