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Differences in formal and informal sports participation at regional level in England

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1. Introduction

In spite of the increasing number of people taking part in sports in Europe during the last thirty years, there has been stagnation in sports participation rates in the last decade. Among Europeans, 42% do not participate in sports (European Commission, 2014), which compares unfavourably with 2009 (39%) and 2004 (40%) (European Commission, 2010, 2004). This situation is common in many European countries, such as the UK, where sports participation (at least one session of at least 30 minutes per week) has stagnated at around 34-36% of population since 2005-2006 (Roberts, 2015). This stagnation in sports participation is of considerable concern due to its impacts on citizens' health and well-being (Department of Health, 2014).

As a consequence, academic interest in sports participation has increased substantially in recent years, with considerable and rich empirical evidence produced on its key correlates (e.g. Cabane & Lechner, 2015; Downward, Lera-López & Rasciute, 2012, 2014 or Downward & Rasciute, 2014). This past research has analysed individual behaviour focusing mainly on micro-data and individual covariates. Recent papers have extended the analysis by considering municipal, regional and national variables using macro-data (e.g. Lera-López, Wicker & Downward, 2016). Nevertheless, there is a lack of papers analysing sports participation at regional level (e.g., Kokolakis, Lera-López & Castellanos, 2014), despite evidence of significant differences in sports participation rates at regional level in many countries such as the UK (Sport England, 2010) and Spain (Garcia & Llopis, 2011). Additionally, a regional analysis is required because of the decentralisation process in sport policies and funding at regional level in many European countries (Lera-López & Lizalde, 2013). Regions with different average incomes require different policies for boosting

participation. Consequently, the significant variations in sports participation rates at regional level and the development of region-specific sport policies justify this research into regional level sports participation.

This research develops the findings of Kokolakis, Lera-López and Castellanos (2014), who investigated the determinants of sports participation at regional level in England, studying the differences among 325 English Local Authorities (LAs). The aforementioned paper emphasised the importance of analysing regional differences in sports participation taking into account regional variables such as socio-demographic variables (e.g., educational level, ethnicity, and size of population), economic variables (income levels and occupations), sport volunteering, and weather conditions. Departing from previous literature, our research is focused on the analysis of regional sports participation in England according to the formal or informal nature of that participation, and incorporating some additional supply-side factors as explanatory variables.

Many studies (e.g., Downward & Rasciute, 2014) have carried out the analysis of sports participation following health guidelines and making a distinction between different durations and intensities to analyse healthy and non-healthy participation. Nevertheless, there is a lack of research analysing how sport participation evolves, apart from the traditional differences between competitive and non-competitive participations. The few papers that have analysed the various ways of taking part in sport have shown a different evolution of formal and informal practices, which are mostly steady or declining, in countries such as Australia, Germany and Flanders (Scheerder & Vos, 2011; Klostermann & Nagel, 2014; Eime et al., 2015). The distinction between formal and informal participation offers an innovative approach for analysing sports participation, elucidating its correlates and, consequently, orientating the design of specific policy actions to increase it. The importance of this distinction lies in the fact that amongst adults we often have a progression from non-

participation to informal and then to formal participation coupled with higher intensity or frequency, which has largely remained unexamined in the main body of literature (see Sport Industry Research Centre, SIRC, 2015, for an example of participation evolution following the London 2012 Olympic Games).

Hence, the unique contribution of this paper is to provide a regional approach for the analysis of sports engagement as well as to examine two different contexts of participation: formal versus informal. Our initial expectation, due to previous empirical evidence about differences in formal and informal participation, is that the regional determinants of both activities might be different. The distinction between formal and informal definition (using the Active People Survey, APS) is based on the frequency and context of participation (sport club, tuition or organised competition). The full definition is explained in the Data section.

2. Literature review

Following Downward et al. (2014) it can be argued that there is rich empirical evidence analysing the correlates of sport participation from different perspectives and disciplines such as economics, sociology, psychology and sport science. The differentiation between formal and informal participation can be traced to Crum's 'sportisation' theory (1991), stating that social trends tend to generate a diversified sporting landscape. On this basis we observe an evolution from infrequent to more frequent participation. Hence, when an increase in frequent participation is observed, this typically originates from a pool of non-frequent participants rather than a pool of non-participants (SIRC, 2015). According to this research, around the time of the London 2012 Olympic Games there was a significant shift of participation from occasional to more frequent forms of participation. In terms of economic theory, many studies use the time-allocation model between labour and leisure of Becker (1965), based on the satisfaction derived from 'basic' commodities (see, for example, Downward, Dawson & Dejonghe, 2009 for further details). However, more recent research

outputs, such as Kokolakis, Papus and Meadows (2015), Kokolakis, Shibli and Davies (2016), underline the significance of a pro-active civic engagement, in cultural activities for example, in the decision to participate in sport, and point towards an expanding theoretical framework incorporating social environmental characteristics. Finally, from a theoretical perspective, the arguments proposed by Borgers, Pilgaard, Vanreusel, and Scheerder (2016) about the role played by institutional change and the characteristics of organisational settings, explain different patterns of involvement in sports participation.

Empirical evidence has typically examined sports participation by focusing on individual characteristics, including income and time constraints, either directly or by using proxy variables (when direct reference is not possible) such as occupation levels, marital status, household size, and the presence of children. In extending this framework, other variables are also considered referring to individual socio-demographic characteristics such as age, education and gender. Both education and gender variables have significant cultural associations (Kokolakis et al., 2016). The empirical evidence concludes that traditionally, adult males are more likely to participate in sport than females (Downward & Rasciute, 2014) and that there is a negative relationship between age and sports participation due to biological and physical limitations (Downward et al., 2014), although in some studies sport frequency increases with age (Breuer & Wicker, 2009a; Garcia, Lera-López & Suarez, 2011) indicating a potentially higher level of health awareness among elder people and an increase in free time during retirement. Reflecting the importance of time constraints, married people and families with more members traditionally participate less in sport (Kokolakis et al., 2014). Finally, educational level and income are positively associated with sports participation (Downward et al., 2009).

Nevertheless, new studies have emphasised the limitations of analysing just individual characteristics to explain sports participation. In particular, various studies have considered

the additional role played by sport supply variables on sports participation. By taking a multilevel approach, these studies have shown how sports participation is constrained by the availability of supply at urban level (Wicker, Hallmann & Breuer, 2013). However, this relationship may be dependent on the nature of sports and sporting facilities reviewed (Hallmann, Wicker, Breuer & Schoenherr, 2012). Other studies have emphasised the positive relationship between government spending on health and education and sports participation rates in the European Union (Lera-López et al., 2016).

There is a lack of studies taking a regional approach to explain the differences of sports participation within countries and areas. Initially, some studies used a national approach, explaining the differences in sports participation in Europe from a set of national variables. For example, Van Tuyckom (2011) tested the relevance of economic variables, such as gross domestic product and the level of public sector expenditure on health, and demographic variables (population density, percentage of urban population, etc.) to explain differences in sports participation rates among European countries. From a regional perspective, Kokolakis et al. (2014) explained the differences in sports participation within English regions by identifying the relevance of some socio-demographic variables (educational level, size of population), economic factors (income levels, occupations) and sports funding and infrastructure (within the current policy context) to explain regional variability of participation. Finally, Humphreys and Ruseski (2007) showed that state government spending on the provision of facilities, such as parks and recreation, increases participation in some sports in the US.

Similarly, there are few studies considering the differences between formal and informal sports participation, in spite of the relevance of this distinction made recently by different authors (Borgers et al., 2016; Borgers et al., 2015; Dawes, Vest & Simpkins, 2014; Thorpe, 2016; Vardermeerschen, Vos & Scheerder, 2015). There are differences in the

evolution of both types of sports activities among countries, with increasing rates of participation in informal sports contrasting with a decline in some organised sports (Borgers et al., 2015; Thorpe, 2016). These studies consider differences in motivations (Borgers et al., 2015; Thorpe, 2016), the opportunities for children and adolescents in sport (Dawes et al., 2014), the requirements for sports facilities to create opportunities for spontaneous sports participation (Borgers, Vanreusel, Vos, Forsberg & Scheerder, 2016), and changes in societal trends (Borgers et al., 2015). Notable differences of the aforementioned articles with this study include the regional perspective and context to explain participation behaviour.

In conclusion, there is a need for further research to be focused on the distinction between organised and informal sports activities in order to understand patterns of sports participation. This paper tries to overcome the lack of regional explanatory studies, analysing the differences in formal and informal sports participation rates in England from a regional perspective. Previous empirical evidence about differences in formal and informal participation suggests that the regional determinants of both activities might be different.

3. Data and methodology

3.1. Data and variables

Our main data source is the Active People Survey 5 (2010/2011), the largest survey of sport and active recreation in Europe (Sport England, 2012). This survey collects annual information about the sports participation of 166,000 English adults (age 16 and over), monitoring more than 400 different forms of sport and active recreation. The sample was randomly stratified and the results are representative of the total adult population in the country and at regional and local levels. The sample corresponds to between 500 and 1,000 respondents per Local Authority area (LA). From the Survey, a dataset was created, collecting information about the 325 English LAs. From this dataset, we have constructed four dependent variables:

First, informal participation at least once per month (y_1), showing the proportion (expressed in the range between 0 and 1) of informal participants in sports activities at least once per month. This is participation outside the parameters of formal participation as defined below.

Second, formal participation at least once per month (y_2), showing the proportion of sport participants that participate at least once per month, at moderate intensity (minimum), AND being a member of a sports club, or receiving sport tuition, or taking part in organised competition. Hence, the formality of participation in sport is determined in APS either through taking part in sport in a club (including keep fit clubs) or through organised competition.

Third, no participation in the last month (y_3), showing the proportion of non-participants (formal or informal). It follows therefore that, $y_3 = 1 - y_1 - y_2$. Fourth, frequent formal participation at least three times per week (y_4), defined as: ‘formal participation’ (y_2) but for three or more times per week.

As independent variables, four different groups have been analysed in line with the previous empirical evidence and theoretical models such as in Kokolakis et al. (2014). Accordingly, a time-income framework of participation shifts when incorporating variables such as education, or gender. Hence, following an extension of the Becker model, incorporating sport supply, we have considered socio-demographic variables including (expressed as percentages): one-member and four-member households; households with at least one child; people having higher education, General Certificate of Secondary Education (GCSE) or A-Levels in a region; people with long lasting illness or disability; gender (in this case males); age (in this case people aged 16-34); and urban population. Economic variables considered include: income level (in this case households with at least £41,600 per year and median gross weekly earnings in a region); people living in council houses; working status (in

this case working full time, part time, students, the unemployed and retired people); and finally, people who live and work in the same area. All the economic variables are expressed as percentages, except for median gross weekly earnings, which is measured in logs.

Given the role played by sport authorities and the influence of supply variables highlighted by previous empirical evidence, we have analysed the effect of National Lottery awards and total local funding for sport (for a three year period, 2007-2010, since these funds could vary from one year to another); the quality of local government through the CPA (Comprehensive Performance Assessment) score; and access to sporting facilities expressed as the percentage of population with 20-minute access to three types of facility (taken from the following six alternatives: pool, hall, health & fitness facility, grass pitch, synthetic turf pitch or golf course). A cultural participation variable –the percentage of people who attended cultural events over the last year– has also been considered, taking into account the evidence that people with active civic profile are more likely to become sports participants (Kokolakakis, Shibli, and Davies, 2016). As specific sport supply environmental variables we have computed the following two ratios (expressed in logs): number of grass pitches / population; and number of health and fitness facilities and swimming pools / population. The source of these supply data is the Sport England's Active Places dataset, which is an online management tool auditing the number of different sport facilities available that has been used previously at LA level (Downward & Rasciute, 2014). Data are updated regularly, mainly through voluntary updates, a telephone survey, feedback from users, and via the monitoring of planning permissions and trade press outlets.

Finally, to consider the influence of local geography, we have included a set of variables that could affect sports activities such as the total area of inland water (lake area) and the number of days on which it rained ('rain days'). These variables were mapped into the main dataset using a Geographical Information System (GIS).

All the aforementioned variables were chosen after a selection process that excluded strong correlation among the independent variables. Since the distributions used in this research (Dirichlet and beta distributions) are non-linear models estimated by ML (Maximum Likelihood), multicollinearity is not as problematic as in the case of linear models estimated by OLS (Ordinary Least Squares). This notwithstanding, and also bearing in mind the parsimony principle, we removed variables associated with high correlation levels (Pearson's coefficient higher than 0.7).

Table 1 shows the list of all the selected variables and their main descriptive statistics.

<INSERT TABLE 1 HERE>

3.2. Methodology

In our study, we have up to four dependent variables measuring sports participation for LAs, which are defined as proportions with a range from 0 to 1, instead of percentages, due to the features of the econometric models employed. Our research focuses on determining the relationship between that regional participation and other variables through a regression structure.

The current methodology emphasises the importance of having an optimised scenario for each dependent variable which can help us tell a story of what happens to participation as we switch from one definition (formal, informal) to another. In this sense, as the variables y_1 , y_2 and y_3 partition the whole population, we establish a case of multiple proportions: on the one hand, the proportions in each category (formal participation, informal participation, no participation) remain between 0 and 1, and on the other hand, the three proportions add up to one. The econometric model of choice for multiple proportions is based on a Dirichlet distribution, which is the multivariate generalisation of the beta distribution i.e. the Dirichlet distribution compared to a beta distribution is a parallel concept to a multinomial versus a binomial logit model. The Dirichlet distribution allows us to obtain simultaneously all the

parameters and marginal effects of the different explanatory variables. In other words, we can model at once the behaviour of the three aforementioned variables in just one econometric specification.

Regarding the other dependent variable, y_4 (formal participation at least three times per week), a beta model is used, since there is no data on informal participation for this frequency. Note that in the former cases (variables y_1, y_2, y_3) an estimation of a beta model for each variable (independently of the others) would lead to biased results (coefficients, marginal effects), since the econometric process of estimation would not have taken into account the restriction of their sum being equal to one. On the contrary, in this context, using the Dirichlet distribution has the advantages of beta models and also satisfies the desirable property of keeping the sum of the proportions (formal participation, informal participation, no participation at all) equal to one.

A detailed discussion of the arguments in favour of the choice of a beta model or its multivariate generalisation, the Dirichlet model, can be found in Paolino (2001) and Kieschnick and McCullough (2003), who warn against the frequent mistake of using a linear regression model estimated by OLS. Other alternatives would also be inappropriate in the current circumstances: for instance, we could use neither a Tobit model, because our dependent variables are not censored but limited to the interval $[0, 1]$, nor a (multinomial or binomial) logit regression since this implies discrete dependent variables whereas proportions are continuous variables.

The beta model is a continuous distribution that has the peculiar characteristic of providing positive density only in a finite length interval, $(0, 1)$. According to the conventions of Generalised Linear Models (GLM), the standard beta model can be expressed as a function of two parameters (Ferrari & Cribani-Neto, 2004):

$$f(x; \mu, \varphi) \text{ with } \mu > 0, \varphi > 0$$

The first, μ (mu), is the so-called location parameter (the mean of the response variable), and the second, ϕ (phi), is the so-called scale parameter.

The beta density function can have different shapes (symmetrical, 'J', 'inverted J', 'U') depending on the values of these two parameters, so it is a very versatile technique and has multiple applications; of which modelling proportions is but one (Gupta & Nadarajah, 2004). In the case of proportions, one particularly interesting feature of the beta distribution is that it takes into account that the mean and the variance may be closely connected: a proportion variable with a mean close to either 0 or 1 generally has a smaller variance compared with a mean of 0.5. Thus, in a quantitative model, any covariate that has a large effect upon the mean is also likely to imply a heterogeneous variance (Paolino, 2001). In this respect, the beta distribution models heteroskedasticity in such a way that the variance is largest when the average proportion is near 0.5, while the mean assumes different values in different LAs depending on the values of the explanatory variables: $\mu_i = f(b_0 + b_1 x_{1i} + b_2 x_{2i} + \dots)$

The beta distribution uses the logistic transformation

$$\mu_i = \frac{\exp(b_0 + b_1 x_{1i} + b_2 x_{2i} + \dots)}{1 + \exp(b_0 + b_1 x_{1i} + b_2 x_{2i} + \dots)}$$

in order to ensure that μ_i remains between 0 and 1.

The former explanations can be useful to grasp the essence of not only the beta model, but also the Dirichlet model, which is a generalisation of the former for the case of two or more dependent variables. In this case, according to the GLM conventions, a parameterisation is used with location parameters μ_i (one for each dependent variable except the base outcome) and scale parameter ϕ . The μ_i values are reported on the multinomial logit scale so that they stay between 0 and 1, and add up to one. On the other hand ϕ is reported on the logarithmic scale to ensure it remains positive.

Due to the fact that both the beta and the Dirichlet model have a nonlinear form, the resulting regression coefficients do not measure the effect of the explanatory variables on the outcome probabilities directly. They can only be interpreted as log-odds (Smithson & Verkuilen, 2006) or, alternatively, various types of marginal effects can be used.

In the case of the Dirichlet model, there is another complication: in this polychotomous model—as in the multinomial logit model—a base category, base outcome or baseline must be established (in our case: ‘No participation’), which provides the ‘reference point’ for all other alternatives (i.e., ‘Informal participation’ and ‘Formal participation’). The choice of base category needs to be kept in mind when the model parameters are interpreted. All coefficients have to be understood relative to the base category. On the one hand, if a coefficient is insignificantly different from zero it does not mean that the associated variable is completely irrelevant. It only means that the variable in question does not affect the choice between that alternative and the base category. To test for complete irrelevancy of a variable we would have to test for that variable having a zero coefficient for all the alternatives. On the other hand, a positive coefficient for the explanatory variable x_i in the equation for option y_j does not necessarily mean that an increase in x_i increases the probability of y_j being chosen. It only means that it increases the probability of y_j relative to the base option; if the base option falls in probability due to the increase of x_i , this positive coefficient could correspond to a fall in the probability of y_j . A similar claim could be made for the case of a negative coefficient for the explanatory variable x_i .

Having briefly explained the technical features of beta and Dirichlet models, we detail the research strategy of the project hereafter. First, we estimate a Dirichlet model (‘model I’) that studies the determinants of both formal and informal participation, taking ‘No participation’ as the base outcome. In a second step, another Dirichlet model (‘model II’) is used to establish the factors behind formal participation and no participation, with informal

participation as the base outcome. Finally, a beta model ('model III') is estimated for the more frequent formal participation. We employ marginal effects in order to compare the extreme cases of starting from no participation (first model) and frequent formal participation (last model). In each case, several models were considered; the selected ones were chosen on the basis of their AIC (Akaike Info Criterion) values.

4. Results and discussion

Table 2 shows the estimates of Model I, i.e., the Dirichlet model with no participation (y_3) as base outcome.

<INSERT TABLE 2 HERE>

From Table 2 the following statistically significant results can be derived:

On the one hand, informal participation (y_1), relative to no participation (y_3) is positively related with the variables of higher education and rain days, and negatively with urban population. On the other hand, formal participation (y_2), relative to no participation (y_3) is positively associated with the variables: higher education, males, income over £41,600, total local funding on sport (Lottery and Exchequer awards), cultural attendance, and rain days; and negatively with children, council houses and inland water.

Hence, a formal participation model makes the demand structure more complex, introducing (compared with the informal model) variables such as the percentage of children in households, gender, percentage of council houses, income over £41,600, local funding, cultural attendance, and inland water. It is worth mentioning that higher education is significant in both the informal and formal participation models, whereas cultural attendance is only statistically significant when we switch from non-participation to formal engagement. Therefore, higher forms of sports participation are characterised by a more active citizenship, expressed in this case by cultural participation. Furthermore, the urban environment initially exerts a negative influence on informal participation, reflecting the fact that at this level of

involvement sport has to compete with other leisure options available. However the urban environment is not a negative factor in formal participation as the presence of a plethora of urban sport clubs makes formal participation easier to attain. Finally, gender is irrelevant in the context of informal participation; whereas in formal participation, males are more likely to participate.

Table 2 includes the corresponding results for Model II, that is, the Dirichlet model with informal participation (y_1) as base outcome. Taking into account the data included in Table 2, we can conclude that on the one hand, formal participation (y_2) relative to informal participation (y_1) is positively associated with the variables: males, urban population, income over £41,600 and cultural attendance; and negatively with council houses. On the other hand, no participation (y_3) relative to informal participation (y_1) is positively related to urban population, and negatively to higher education and rain days.

Here the important insight is provided by the variables associated with formal participation as we switch from no participation to formal participation. The positive influence of a high income is opposed to the drawback of living in a council house; as in the case of Model I, cultural attendance is a factor that favours formal participation, which shows that forms of civic engagement are important when we switch from no participation to formal participation. Sports club membership is often an important way of achieving formal participation (with significant economic consequences in terms of spending on sport and generating employment-see for example Sport Northern Ireland, 2013), hence the urban environment is a positive factor as we switch from informal to formal participation.

Finally, Table 2 shows the estimates of Model III, i.e., the beta model for frequent formal participation (y_4). It shows that frequent formal participation is positively associated with the variables: higher education, males, income over £41,600, rain days and (health and fitness + swimming pools) / population; and negatively with children in the family.

It is important to point out that for frequent participation, sport supply is obviously an important variable of association but this is not the case for cultural attendance. The impact of cultural attendance has a positive relationship only with the less frequent levels of formal participation; however, when we reach a frequency of three times a week, then the limited time dimension is at work in the opposite direction.

To sum up, from the above results we can conclude that having children at home is an obstacle to formal participation; however, this factor has no relevance in the case of informal participation. Higher education increases the probability of all the three contexts of sports participation. In the case of gender, being male is a positive factor in formal participation, especially if this is frequent. However, gender seems to have no association with informal participation. Inversely, urban population is an adverse factor for informal participation, whereas it has no relationship with formal participation. Council housing and inland water are negatively associated with infrequent formal participation; they have no relationship with frequent and informal participation. Income over £41,600 is a relevant variable in both modes of formal participation (especially in the case of frequent participation), increasing the probability of engagement. Total funding of sport and cultural attendance are only relevant in the case of infrequent formal participation, with positive associations in both cases. This reinforces the former discussion, with cultural attendance being an important factor of formal participation, assuming that the time requirements for engagement in sport and culture are not incompatible. Rain days have a positive relationship with all three types of participation. Finally, the ratio (H&F + swimming pools) / population shows a positive association with frequent formal participation.

As the last point of this research, a comparison is made of the 'size' of the effects of the explanatory variables, as we switch from informal participation (model I) towards frequent formal participation (model III). However, since the models used are nonlinear, the

regression coefficient estimates should not be used to carry out comparisons of the effects of explanatory variables on the three categories of sports participation. For this purpose, we use marginal effects ($\partial y/\partial x_i$), which allow the determination of the impact of each covariate. A marginal effect (ME) is the change in the predicted dependent variable for a unit change in the explanatory variable, assuming that the effect does not change over the interval. Table 2 reports the MEs of models I, II and III, for the various regressors, evaluated at their sample means and expressed as percentages. For the sake of simplicity, only the MEs of the conjointly statistically significant explanatory variables will be commented upon.

From the comparison of the MEs, and speaking in relative terms, the following results can be derived. The most powerful effect corresponds to Rain, which implies a strong stimulus for the three contexts of sports participation, especially in the case of frequent formal participation (the ME is slightly higher, 7.4%). The second most relevant factor is represented by *Income over £41,600*, but only with regard to formal participation (particularly if this is not frequent: 75% higher than the ME of frequent participation). The variable Children, according to the size of its ME, has a discouraging effect on the two types of formal participation, particularly if this is non-frequent (ME 27.3% higher). The variable Males shows MEs similar to those for Children, but its impact is positive; the ME is 20% higher in infrequent formal participation. Finally, the variable Higher Education has a positive impact on both types of formal participation, especially in the case of frequent participation (ME is 11.1% higher).

5. Conclusions and policy implications

This study contributes to the literature by examining three contexts in sports participation at regional level: informal, formal, and frequent formal as well as the transition from one stage to another. In particular, this paper identifies factors associated with formal / informal sports participation. The importance of this distinction lies in the fact that it is very

unlikely (due to psychological and physiological factors) that people switch directly from non-participation to frequent formal participation. A probable route for sports participation is to change from non-participation to informal participation before perhaps increasing the frequency of participation and switching to formal types of engagement involving club membership, tuition or competition. Hence, this research is important because it does not deal with sports participation in general, but it examines its transition from one stage to another: informal participation (at least once in four weeks), formal participation (at least once in four weeks) and frequent formal participation (at least three times a week). This distinction has been verified previously by SIRC (2015) in the case of London 2012 and by Ramchandani et al. (2014) in terms of the inspiration effect of major sports events. Verification that the pattern of evolution in sport participation from one level to another is not uniform is also provided by this research along with the different variables that are at play in each case. However, as a note of caution, this research output is specific to England and without further research should not be generalised.

After reviewing the three stages of participation, some positive associations, such as household income above £41,600, were detected which are common in all transitions, i.e. from non-participation to informal, then to formal and finally to frequent. Although household income depends on individual factors, LAs can implement policy incentives favouring the less well off households, aiming to increase their sports participation..

The importance of a pro-active civic engagement is underlined by the positive associations of higher education, in the case of informal participation, and cultural attendance in infrequent formal participation. For policymakers it would be helpful to understand that sport could flourish in a pro-active social environment characterised by wider engagement in cultural and civic activities. This however is only true in the infrequent framework of analysis: when we introduce frequent participation (at least three times a week) the latter

competes for limited time resources making any cultural participation non-significant. Thus there are people who choose to have well rounded engagement in a range of sporting and cultural activities and others who choose to concentrate on sport specifically.

The model shows some elements of exclusion: in the case of gender, there is a positive relationship with being male and a negative relationship with the existence of children in a family. This creates the possibility that an unequal distribution of household duties around children may prevent some women from taking part in higher levels of sports participation. Consequently, society cannot address the long term historical issue of gender inequality in sports without alleviating the problem of child care, especially for poorer families. However the problem is rooted deeply: recent research for DCMS (Kokolakakis et al., 2016) showed that the existing gender inequality in sports participation is developed at very young ages, making it a cultural parameter. Additionally, the model shows elements of motivation: clearly there is a strong association between sports participation and civic engagement parameters such as cultural participation. To achieve formal participation it would be advisable to undertake a culturally integrated approach, motivating cross-sectoral participation. This argument is reflected in the policy of some EU countries, such as Germany, where young people are encouraged to have some democratic experience within sport clubs as a step towards individual and democratic maturity (Breuer and Wicker, 2009b).

The model also addressed the case of sport supply and sport funding. The number of health and fitness clubs and swimming pools per population unit exerts a positive influence on the transitions from non-participation to informal participation, as well as in the case of frequent formal participation. Sport funding is very important for the transition from non-participation to formal participation; however, such association is not detected in the switch from informal to infrequent formal participation. This finding has policy implications, since it shows that for a given sports infrastructure, no addition to sport supply or funding would

facilitate such a transition, indicating that the problem is in the direction of policy, not just in the amount of funds available directly for sport.

Finally, the model addressed the influence of an urban environment, revealing that although it has a negative association when considering a switch from non-participation to informal participation, this reverses to a positive association when examining the transition from informal to formal. The urban environment provides a variety of leisure choices which compete for the attention of non-participants and thereby restricts the growth potential of informal participation. However, in the context of formal participation, the urban environment can facilitate informal participants to make the transition through a strong supply of sport clubs and health and fitness facilities.

This research has focused on the transitional element of sports participation between three different participation stages within the LA framework in England. It refers to a single country and uses cross-sectional data; hence the results are limited both spatially and temporally. The basic technique can be extended to a transitional model focusing on individuals where the identified factors of association can be examined in further detail to fine-tune sports policy and to explore the situation in other countries. To move in this direction, further analyses are required using longitudinal datasets and examining the evolution of sports participation among the same set of participants. Some research has already been conducted for Sport England in this direction, but a more systematic approach should be adopted in the future.

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Table 1

List of Variables and Descriptive Statistics

Variable name	Variable description	Mean	Std. Dev.
1. Dependent variables			
Informal participation (y_1)	Informal participation, at least one per month	.19	.02
Formal participation (y_2)	Formal participation, at least one per month	.24	.04
No participation (y_3)	No participation (neither formal nor informal), at least one per month	.57	.05
Frequent formal particip. (y_4)	Formal participation, at least three times per week	.14	.03
2. Explanatory variables			
2. 1. Socio-demographic variables			
Single household (x_1)	% of one-member households in the region	19.88	3.61
Children (x_2)	% of households with at least one child in the region	30.43	3.74
Four or more adults (x_3)	% of households with four or more adults in the region	11.41	2.99
GCSE (x_4)	% of people having a GCSE in the region	13.88	2.87
A-Levels (x_5)	% of people having an A-Level certificate in the region	17.76	2.61
Higher education (x_6)	% of people having a degree (as their highest qualification) in the region	27.64	9.19
Illness (x_7)	% of people with a limiting long lasting illness, disability or infirmity	23.60	3.93
Males (x_8)	% of people being male in the region	40.44	2.40
Age 16-34 (x_9)	% of people between 16 and 34 years old in the region	16.73	4.55
Urban (x_{10})	% of people living in urban areas in the region	84.93	16.50
2. 2. Economic variables			
Council (x_{11})	% of people in the region living in council houses ^a	6.35	4.67
Income over £41,600 (x_{12})	% of people with personal income over £41,600 per year	32.66	10.02
Full-time (x_{13})	% of people working in full-time jobs in the region	45.02	4.56
Part-time (x_{14})	% of people working in part-time jobs in the region	13.43	2.18
Retired (x_{15})	% of people who are retired in the region	23.29	5.12
Student (x_{16})	% of students as working status in the region	7.38	2.85
Unemployed (x_{17})	% of unemployed people as working status in the region	4.54	1.97
Median earnings (x_{18})	Median gross weekly earnings in the region (expressed in logs)	6.01	.16
Live and work in one area (x_{19})	% of residents in a region that also work within it	57.04	16.16

Table 1

List of Variables and Descriptive Statistics (continued)

Variable name	Variable description	Mean	Std. Dev.
2. 3. Sport and civil participation variables			
Local funding (x ₂₀)	Total Lottery Funding, Exchequer Awards and Capital Expenditure in sport during the period 2007-2010 in LAs, thousands (in logs)	12.90	1.82
CPA (x ₂₁) ^d	CPA (Comprehensive Performance Assessment) score	2.55	.95
Cultural attendance (x ₂₂)	% of people in the region who attended cultural events over the last year.	49.88	6.97
20 min 3 facilities (x ₂₃)	% of population that live within 20 minutes' travel from three types of facilities (without any Quality Assured features)	79.58	11.07
2. 4. Environmental variables			
Inland water (x ₂₄)	Total area of inland water in a region, including lakes totally within its limits and lakes that intersect its 10km radius based perimeter	9.16	4.56
Rain (x ₂₅)	Rain days (in logs) ^e	4.80	.14
Grass pitches (x ₂₆)	Grass pitches / Population (thousands, 16 or more years old) (expressed in logs of this ratio)	-.24	.60
H & F + Swim (x ₂₇)	(Health & Fitness + Swimming pools) / Population (thousands, 16 or more years old) (expressed in logs of this ratio)	-1.39	.38

Notes.

- (a) Council houses are built and operated by LAs to supply well-built homes on secure tenancies at reasonable rents to, primarily, working-class people.
- (b) An index on temperature variability on the survey period in the area based on maximum and minimum values from 192 weather stations in the UK: Ln (Max. temp. - Min. temp.).
- (c) Number of days (expressed in logs) with a rain higher than 1mm over the month of the interview.
- (d) It measures the LA performance (assessed quality of local government) providing different services to the population, including sports services. The score has five categories, from zero to five stars

Table 2

Coefficient Estimates and Marginal Effects of Model I, Model II and Model III

Model I					Model II					Model III				
	Coef.	Marg. Eff.	S. E.	p-value		Coef.	Marg. Eff.	S. E.	p-value		Coef.	Marg. Eff.	S. E.	p-value
mu2 (= y ₁ , Informal particip.)					mu2 (= y ₂ , Formal particip.)									
Single household	-.0035	-.0420	.0050	0.493	Single household	.0011	-.0270	.0058	0.849	Single household	.0049	.0600	.0059	0.409
Children	-.0026	-.0034	.0032	0.405	Children	-.0055	-.1400	.0037	0.134	Children	-.0092	-.1100	.0037	0.012**
Four or more adults	-.0033	-.0320	.0034	0.336	Four or more adults	-.0006	-.0570	.0039	0.870	Four or more adults	-.0012	-.0100	.0039	0.764
GCSE	-.0004	-.0110	.0046	0.932	GCSE	.0014	.0210	.0053	0.785	GCSE	-.0013	-.0100	.0053	0.808
A-Levels	.0048	.0520	.0042	0.249	A-Levels	-7.28e-06	.0660	.0048	0.999	A-Levels	.0015	.0200	.0048	0.754
Higher Education	.0059	.0650	.0029	0.043**	Higher Education	-.0005	.0720	.0033	0.885	Higher Education	.0069	.0800	.0034	0.041**
Illness	.0037	.0580	.0037	0.313	Illness	-.0040	-.0220	.0043	0.347	Illness	.0045	.0500	.0043	0.295
Males	-.0012	-.0460	.0035	0.729	Males	.0073	.1200	.0041	0.072*	Males	.0091	.1000	.0041	0.027**
16-34 yrs.	-.0039	-.0510	.0039	0.319	16-34 yrs.	.0020	-.0170	.0045	0.658	16-34 yrs.	-.0034	-.0400	.0046	0.462
Urban	-.0016	-.0260	.0008	0.046**	Urban	.0020	.0160	.0009	0.024**	Urban	.0005	.0100	.0009	0.554
Council	.0017	.0510	.0027	0.518	Council	-.0071	-.1100	.0031	0.023**	Council	-.0014	-.0200	.0032	0.666
Income over £41,600	.0033	-.0046	.0024	0.170	Income over £41,600	.0088	.2100	.0027	0.001***	Income over £41,600	.0100	.1200	.0027	< 0.001***
Full-time	.0047	.0500	.0064	0.462	Full-time	.0003	.0700	.0074	0.972	Full-time	.0082	.0900	.0075	0.276
Part-time	.0014	.0140	.0073	0.849	Part-time	.0002	.0220	.0085	0.984	Part-time	.0032	.0400	.0085	0.701
Retired	-.0053	-.0710	.0070	0.447	Retired	.0030	-.0190	.0081	0.714	Retired	.0020	.0200	.0082	0.804
Student	.0006	.0210	.0080	0.944	Student	-.0033	-.0530	.0092	0.719	Student	-.0007	-.0100	.0094	0.936

Table 2

Coefficient Estimates and Marginal Effects of Model I, Model II and Model III (continued)

	Coef.	Marg. Eff.	S. E.	p-value		Coef.	Marg. Eff.	S. E.	p-value		Coef.	Marg. Eff.	S. E.	p-value
Unempl.	.0007	.0440	.0091	0.940	Unempl.	-.0081	-.1400	.0106	0.446	Unempl.	-.0144	-.1700	.0107	0.177
Median earnings	-.0524	-.1200	.1155	0.650	Median earnings	-.0980	-.2.5200	.1330	0.461	Median earnings	-.1492	-1.7200	.1323	0.260
Live and work same area	.0011	.0130	.0007	0.131	Live and work same area	-.0003	.0094	.0008	0.715	Live and work same area	.0006	.0100	.0008	0.431
Local funding	.0052	.0200	.0053	0.322	Local funding	.0080	.2200	.0060	0.183	Local funding	.0098	.1100	.0060	0.101
CPA	.0099	.0960	.0089	0.262	CPA	.0022	.1800	.0103	0.828	CPA	.0138	.1600	.0104	0.182
Cultural attend.	.0009	-.0300	.0026	0.717	Cultural attend.	.0088	.1700	.0030	0.003***	Cultural attend.	.0032	.0400	.0030	0.286
20 min 3 facilities	-.0008	-.0066	.0010	0.415	20 min 3 facilities	-.0005	-.0200	.0011	0.685	20 min 3 facilities	-.0019	-.0200	.0011	0.100
Inland water	-.0015	-.0095	.0020	0.441	Inland water	-.0015	-.0490	.0023	0.509	Inland water	-.0012	-.0100	.0023	0.613
Rain	.2132	2.7100	.0710	0.003***	Rain	-.0925	1.2400	.0827	0.263	Rain	.2517	2.9100	.0832	0.002***
Pitches	.0114	.2400	.0265	0.668	Pitches	-.0269	-.3400	.0303	0.374	Pitches	.0009	.0100	.0301	0.976
H & F + Swim	.0269	.2000	.0337	0.424	H & F + Swim	.0199	.7400	.0388	0.607	H & F + Swim	.0750	.8700	.0388	0.053*
Constant	-1.9122	—	1.0747	0.075*	Constant	.3551	—	1.2386	0.774	Constant	-33.6040	—	12.3410	0.006***
mu3 (= y ₂ , Formal particip.)					mu3 (= y ₃ , No particip.)									
Single household	-.0023	-.0270	.0046	0.611	Single household	.0035	.0690	.0050	0.493					
Children	-.0081	-.1400	.0029	0.005***	Children	.0026	.1400	.0032	0.405					
Four or more adults	-.0039	-.0570	.0031	0.209	Four or more adults	.0033	.0890	.0034	0.336					
GCSE	.0011	.0210	.0042	0.799	GCSE	.0004	-.0100	.0046	0.932					
A-Levels	.0048	.0660	.0038	0.204	A-Levels	-.0048	-.1200	.0042	0.249					
Higher Education	.0054	.0720	.0026	0.041**	Higher Education	-.0059	-.1400	.0029	0.043**					
Illness	-.0003	-.0220	.0034	0.931	Illness	-.0037	-.0360	.0037	0.313					
Males	.0061	.1200	.0032	0.058*	Males	.0012	-.0710	.0035	0.729					
16-34 yrs.	-.0019	-.0170	.0036	0.600	16-34 yrs.	.0039	.0680	.0039	0.319					
Urban	.0005	.0160	.0007	0.502	Urban	.0016	.0100	.0008	0.046**					

Table 2

Coefficient Estimates and Marginal Effects of Model I, Model II and Model III (continued)

	Coef.	Marg. Eff.	S. E.	p-value		Coef.	Marg. Eff.	S. E.	p-value		Coef.	Marg. Eff.	S. E.	p-value
Income variance	-.0183	-.2800	.0121	0.131	Income variance	.0122	.3800	.0134	0.363					
Council	-.0054	-.1100	.0025	0.030**	Council	-.0017	.0550	.0027	0.518					
Income over £41,600	.0120	.2100	.0021	< 0.001***	Income over £41,600	-.0033	-.2000	.0024	0.170					
Full-time	.0050	.0700	.0059	0.396	Full-time	-.0047	-.1200	.0064	0.462					
Part-time	.0016	.0220	.0067	0.815	Part-time	-.0014	-.0370	.0073	0.849					
Retired	-.0023	-.0190	.0064	0.715	Retired	.0053	.0900	.0070	0.447					
Student	-.0027	-.0530	.0073	0.706	Student	-.0006	.0320	.0080	0.944					
Unempl.	-.0074	-.1400	.0084	0.378	Unempl.	-.0007	.0950	.0091	0.940					
Median earnings	-.1503	-.25200	.1047	0.151	Median earnings	.0524	.2.6300	.1155	0.650					
Live and work same area	.0008	.0094	.0006	0.233	Live and work same area	-.0011	-.0220	.0007	0.131					
Local funding	.0133	.2200	.0047	0.005***	Local funding	-.0052	-.2400	.0053	0.322					
CPA	.0122	.1800	.0081	0.136	CPA	-.0099	-.2700	.0089	0.262					
Cultural attend.	.0097	.1700	.0023	< 0.001***	Cultural attend.	-.0009	-.1400	.0026	0.717					
20 min 3 facilities	-.0013	-.0200	.0009	0.157	20 min 3 facilities	.0008	.0260	.0010	0.415					
Inland water	-.0030	-.0490	.0018	0.094*	Inland water	.0015	.0580	.0020	0.441					
Rain	.1207	1.2400	.0664	0.069*	Rain	-.2132	-3.9500	.0710	0.003***					
Pitches	-.0156	-.3400	.0238	0.514	Pitches	-.0114	.0930	.0265	0.668					
H & F + Swim	.0469	.7400	.0305	0.125	H & F + Swim	-.0269	-.9300	.0337	0.424					
Constant	-1.5571	—	.9777	0.111	Constant	1.9122	—	1.0747	0.075*					
Phi	325.1557		17.3253		Phi	325.1557		17.3253		Phi	291.0046		21.9593	

Models I & II: Number of obs = 351; Wald chi2 (56) = 902.44; Prob > chi2 = < 0.001; Log likelihood = 1680.47; AIC = -3242.94; BIC = -3015.16
 Model III: Number of obs = 351; Wald chi2 (28) = 343.39; Prob > chi2 = < 0.001; Log likelihood = 879.28; AIC = -1698.57; BIC = -1582.74

Notes: μ_i (i= 1, 2, 3) are the location parameters (= means) of the distributions of the dependent variables measuring sport participation. Standard Errors (S. E) refer to Coefficients.
 Marginal effects (Marg. Eff.) are calculated at the mean values and, for the sake of their small size, are expressed in %.
 (*) Statistically significant at 10% level; (**) Statistically significant at 5%; (***) Statistically significant at 1%.

