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Does higher sport supply lead to higher sport demand? A city level analysis

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Abstract

This paper explores the decision to participate in sports activities and the subsequent frequency of participation using data from a big German city, Munich, representative sample of individuals in 2008. Individual and socio-economic variables characterizing the individuals were collected. A new type of variable, which has not been included in the existing econometric studies yet, is introduced: the availability of sport infrastructures, including their geographical localization and the type of infrastructure. If building sport infrastructures can be seen as an investment and as a consequence a cost for the city, sport infrastructures can also be considered as a factor influencing positively the sport demand. However, the localization of such an infrastructure can be seen as a time and income constraint for the sport participant if the distance from the home is too important. Traditional non linear econometric analysis, logit and poisson models, as well as two-level nonlinear hierarchical models are used to examine the empirical evidence provided by the data collected by survey including 11.715 persons. The results suggest that social and individual characteristics are of paramount importance in determining sports participation and sports frequency, as shown in the 2 recent econometric studies based on UK and US data (Downward, 2007 and Humpreys and Ruseski, 2007). In our study related to the city Munich, we can see that the impact of the variable age is non linear, that the gender is highly significant in explaining the differences of sport participation and the impact of the level of school attendance on sport practice are significantly explanatory. A very interesting result is the explanatory power of the variable ethnicity, or nationality of the person and we take a particular attention on it. The regression coefficients related to different nationalities differs among sport disciplines. These differences could be explained no only by sociological reasons, but also by economic reasons, among other things. The economic variables, taking alone, particularly the monthly income of the person interweaved, have a lower impact on both the decision to practice sport and the frequency of the sport activity. The most innovative result of our econometric study is to state, through an analysis of each kind of sport infrastructures, that the sport practice supply in an acceptable distance from the individual home has a significant and positive impact on both the decision of practicing a sport and on the frequency of this activity. These results, related to the city Munich, open an alternative way of considering the urban sport demand. Such a study could allow predicting the outcomes of political decisions in the domain of sport for all at the city level, the econometrical models using there being able to predict on how many percent the sport participation would increase if a new sport infrastructure would be built.

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1. Introduction

The topic of the demand for professional sport has attracted substantial attention in the sport economics field, as shown by the exhaustive review of the literature written by Borland & Macdonald in 2003. A main feature studied is the determinants for sport attendance. According to these studies, this demand is affected by the uncertainty of outcome, is lower in lower division of competition, higher at newer stadiums, responsive to time conditions and match timing, is price sensitive and affected by transport costs. This literature has focused largely on the UK and USA, as Borland and Macdonald underline in their conclusion. Less studied is the topic of the demand for sport practice. Two recent studies, Downward & Riordan (2007) and Humpreys & Ruseski (2007) explore the decision to participate in sports activities using respectively a large nationally representative dataset for the United Kingdom and for the USA. These two contributions are based on theoretical models and aim at testing some theoretical outcomes empirically. These two studies show that the decision to practice sport is influenced by the person`s own characteristics (micro level), among them age, gender, sociological variables, ethnicity, education and economic variables like employment status and income. The question posed in this article is the following: can this decision also be influenced by factors on the macro level, as the availability of sport facilities? A new issue in our study is to add explanatory variables to take sport supply at a city district level into account. Indeed, our intuition is that more facilities can facilitate the access to sport infrastructures in terms of distance and time.

In Germany, there are about 90 000 sport associations. The number of members is growing regularly, although we can observe a slow down in the last decade (Table 1). This evolution differs across sports and the non organized sport, even if very difficult to measure, is also growing.

Tab. 1: Evolution of the sport participation in clubs in Germany

	Sport membership	**Evolution**
2000	23 358 000	
2002	23 568 000	0.90%
2004	23 647 000	0.34%
2006	23 708 000	0.26%

Source: Statistisches Jahrbuch Deutschland (2008)

There are (in 2000) 126 954 Sport infrastructures in Germany. Among them, 2/3 is held from the city and public organizations whereas 1/3 of them belong to the private sector. The distribution of different types of infrastructures can be summarized in the following table.

Tab. 2: The sport infrastructures in Germany

Type of infrastructure	Part of the total number of infrastructures
Outdoor infrastructures	47.40%
Indoor infrastructures	27.90%
Large sports and multipurpose hall	0.30%
Swimming pools	6.10%
Tennis courts	11.20%
Ice rinks	0.15%

Source: Statistisches Jahrbuch Deutschland (2008)

Our article is organized as follows: we first briefly review the theoretical backgrounds on leisure sport demand. We then present our empirical model in a second part. We will present in a third part our econometrical study on the data of the city of Munich and comment the results. We conclude by giving some political implications of our results and suggesting further researches.

1. The economic theories of sport participation[1]

According to the neo-classical economic theory, the agents maximize their utility under time and budget constraints. Sport activity and more generally leisure, is defined as the dual of work, work providing income for consumption.

More recent studies explore the consumption of time and extend the constraints to those imposed by individuals being part of the households. Indeed, according to Becker (1976), the household is the appropriate level of analysis.

As sport is assumed as a normal good, the sport participation is increasing with the income. At the same time, the existing studies have shown a low price elasticity of the sport demand.

The demand for Sport practice is a specific demand. Sport practice is considered as a merit good, determined by government to be good for people, with positive externalities (health, education, social cohesion …) , so that the market price does not reflect benefits to individuals and society.

To the heterodox economic theories …

[1] This short review of the literature is partly taken from the exhaustive survey of Downward, 2007.

Are there alternatives to the neoclassical theory to analyze the demand for sport? Downward (2004), in the *Journal of Post Keynesian Economics*, wrote an article entitled: "On leisure demand: a Post Keynesian critique of neoclassical theory". According to the author, the analysis of leisure and consequently of sport practice- provides an opportunity to criticize mainstream economic analysis as well as contributes toward our understanding of an important facet of modern economies.

Among the heterodox economic approaches applied to leisure and sport- demand, the most important is the Post-Keynesian consumer choice. This theory underlines the following points that differentiate it from the neo-classical theory. According to this approach, the social values, classes, context for individuals are important when making choices between work and leisure (Galbraith,1958). The consumption is hierarchically organized: households with lower income will focus less on leisure thane the priorities of food, housing (Gratton & Tice,1991).

The income effect dominates the substitution effect and learning by doing as well as the consumption spillover effects: the consumer needs to acquire the equipment and skills required to consume complex goods, such as water sport activities (Adam et al, 1968).

2. Building an empirical model

Previous econometric studies and new issue

The previous econometric literature uses 3 main types of independent variables to explain the demand for sport activity: the individual characteristics of the person, its sociological characteristics and its economic situation. A fourth type of variables deals with the number of sports practiced. No variable about sport infrastructures are mentioned. Only in the UK study, the different regions could be a proxy of sport offer. The different variables tested in these three different categories are summarized in the Table 3:

Tab. 3: The determinants of sport participation in the United Kingdom and in the USA

	individual variables	sociological variables	economic variables	sport variables	others
Downward and Riordan (2007a) and (2007b)	Age Sex Marital status Household composition Health Smoking Drinking	Ethnicity (British or foreign) Education	Employment status Access to motor vehicle Income Hours worked unpaid hours	sport in club sports volunteering number of sport activities number of arts and leisure activities	region
Humpreys and Ruseski (2007)	Age Marital status Number of children Sex Health	Ethnicity (Black, hispanic) Education	Employment status		month

In our paper, we try to go one step further by making the following hypothesis. Suppose that we consider sport infrastructures the sport offer. Building sport infrastructures can be seen as an investment and as a consequence a cost for the city.

Suppose now that we consider sport infrastructures a factor influencing the sport demand: According to the Clawson & Knetsch (1966), the localization of such an infrastructure can be seen as a time constraint and an income one for the sport participant and the distance of travel is used to proxy the price to pay for the sport activity.

Consequently, fewer infrastructures mean that the consumer spends more time and more money to reach the sport place[2]. Not enough infrastructures imply a long distance of travel to reach far away infrastructures and could strengthen the budget constraint. In contrast, building new sport infrastructures could stimulate the sport practice. Thus, the relative weight of sport in the leisure part of the utility function would be higher. At the same time the budget constraint of the households would be modified. The households could consequently modify their leisure sport consumption level.

To test the explanatory power of the number of sport infrastructures on the demand for sport at the city level, we use two different ways of introducing this variable in our analyses. The first method is a traditional one. We explain the decision of sport participation by the different explanatory variables according to the post Keynesian consumer choice theory and add the sport infrastructures variables defined as the existence of sport infrastructures in the district of the city where the person lives. Afterwards we explain the frequency of the sport participation with the same variables.

The second method differs in that we explain the decision of sport participation in the different districts of the city. The number of sport infrastructures for different districts of the city is taken into account separately, in a second equation characterizing the different districts of the city. We then explain the frequency of sport participation in the same way.

In the first approach, we use traditional econometrics to explain the decision of sport participation. The use of a logit model is adapted because of the binary data. Indeed, the explained variable can take only two values, 1 when the person practices sport, 0 else. The study of the frequency of sport participation is only possible with a poisson model, our dependant variables being count data. Our observations can take only the non-negative integer values {0, 1, 2, 3,}, and these integers arise from counting rather than ranking.

In the second approach, we use Two-level nonlinear hierarchical models, the hierarchical models being more generally called “HLM models” (Raudenbush & Bryk, 2002). Our research combines individual characteristics of the households in Munich and data about sport supply collected for each district of Munich so that it requires an analysis of 2 levels: the “micro-level”, or individual level, with socio-economic characteristics of the households and the “macro-level”, in our case the district level, with data about sport infrastructures. The HLM models used in this approach can fit models to outcome variables that generate a linear model with explanatory variables that account for variations at each level, utilizing variables specified at each level.

[2] We can note that a recent study on the data of 2 German cities (Pawlowski, Breuer, Wicker & Poupaux, 2008) takes the travel time to sport infrastructure into account to explain the sport participation.

The HLM models are often used in the social sciences. In sociology, data structures are often hierarchical: the researchers analyze variables describing individuals, but these individuals are grouped into larger units and there are variables describing these higher units (Raudenbush & Bryk, 2002).

A very often cited study is the seminal paper written by Braun, Jones, Rubin & Thayer (1983): the authors collected data from student in 59 graduate business schools to predict later academic success (these schools base then there admission decision on such statistical test). 14 schools had no minority, 20 schools had only 1 to 3 minorities. So developing prediction equations for minorities in these schools would have been impossible using standard regression methods. Another example is the study of Mason, Wong & Entwistle (1983) used HLM models to examine the effects of maternal education and urban versus rural residence on fertility in 15 countries.

The HLM models where for the first time used in sport management by Todd, Crook & Barilla in 2002 to analyze how organizational and individual factors in Major league Baseball impact individual players salaries.

The HLM models although not so often used, can also be helpful in economics. In economics, if we follow individuals over time, then the measurement for any particular individual are a group, in the same way as the school class is a group. Moreover, there is the problem of relating the micro- and the macro-level. This will be the departure point of our analysis.

3. Econometrical study

The data we use in our study are taken from a survey of 11 715 persons living in the city of Munich. Among them, 11 572 persons fully answered the questions. The used sample is representative for the city of Munich considering age, sex and nationality. All cases contain information regarding the geographical position where the persons live.

8861 persons practice sport (75.64 %) and 2854 persons do not practice any sporting activity sport (24.36 %). Concerning the sport participation frequencies (question: how many times per week do you practice sport?), about one third of the asked people practices sport once or twice a week, 50% practice sport 3 times a week or less and 46% between 5 and 9 times a week. 2022 persons practice sport away from the sport infrastructures.

In addition to this telephone survey, secondary data about sport supply (sport offers and facilities; macro-level) in Munich were made available by the city of Munich. With regard to sport offers, offers from several providers (nonprofit sport clubs, commercial sport providers, and municipality) were taken into consideration[3]. Pertaining to sport facilities, both common sport facilities (gymnasiums, sport fields, swimming pools, dance rooms, and tennis courts) and other sport infrastructure (parks) were taken into account. As the micro-level data base this macro-level data base is also linked to geographical data (geographical position of sport offers and facilities). Thus the impact of sport supply on sport demand can be analyzed in accurately defined areas.

[3] The dataset including the different types of providers is not achieved yet, due to numerous missing data about the localisation of the providers.

The individuals variables which represent individual and sociological characteristics of the respondent are the following: gender (Dummy variable=1 if woman), age, ethnicity (we consider the place of birth of the individual and distinguish 8 regions: Western Europe, Eastern Europe, North America, Latin America, Asia, Africa, Germany and others) and educational attainment (9 choices from the lower to the highest educational attainment).

We then add the individuals variables monthly net income of the household (logarithm) and employment status (Dummy variable=1 if unemployed) to take the economic characteristics of these persons into account.

Finally, we distinguish 6 types of sport infrastructures: Indoor infrastructures for the indoor activities (volleyball, badminton, handball, basketball, tennis table, box, combat sports), outdoor infrastructures for the outdoor activities (football and hockey), tennis courts (indoor and outdoor), swimming pools (indoor and outdoor) for aquatic activities, gymnastic and dance hall and finally parks for walking and running.

In our first approach, the two models, respectively aiming to explain the decision and the frequency of sport participation, take the following form:

$$\log\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \sum \beta_j X_{ji} + r_i$$

$$\log Sfreq_i = \log \gamma_0 + \sum \gamma_{ji} X_{ji} + t_i \ ,$$

with in the individual and Pis the “ith” individual's probability of participating in a sport activity, I is for individuals, j for districts. In our second approach, where we distinguish the “micro-level”, or individual level, from the “macro-level”, or district level, the two models tested are as follow:

$$\begin{cases} Sact_{ij} = \beta_{0j} + \sum \beta_j X_{ji} + r_{ij} \\ \beta_{0j} = \lambda_{0j} + \lambda_{0j} Infrastructure + u_{0j} \end{cases}$$

$$\begin{cases} Sfreq_{ij} = \gamma_{0j} + \sum \gamma_j X_{ji} + r_{ij} \\ \gamma 0j = \alpha_{0j} + \alpha_{0j} Infrastructure + v_{0j} \end{cases}$$

In the first approach, we consider 9280 observations, 6467 persons practicing sport. In the Two-level nonlinear models, we have 7176 observations, 5944 persons practicing sport and 77 districts. Compared to the first approach, the number of observations is lower, due to a too little number of observations in 23 districts, which make an analysis in these districts impossible.

Tab. 4: econometric results

	Sport participation: YES or NO		Sport participation: FREQUENCY	
	LOGIT Model Coefficients	HLM Model Coefficients	POISSON Model Coefficients	HLM Model Coefficients
Intercept	ns	0.434 **	0.4297 ***	0.383 ***
Gender	-0.0829*	-0.088 *	-0.0780 ***	-0.076490 **
Age	0.0168**	-0.002 **	0.0132***	0.005 ***
age2	-0.00024***		-0.0001***	
Ethnicity				
Western Europe	ns	ns	0.118*	ns
Eastern Europe	ns	ns	-0.096**	ns
North America	ns	ns	0.187*	ns
Latin America	1.789**	1.797**	0.364*	ns
Asia	ns	ns	ns	ns
Africa	ns	ns	ns	ns
Others	-0,736***	-0,602***	-0.286***	-0,249**
Educational attainment				
2	0.3216*	0.331 *	-0.0697 **	ns
3	0.7347***	0.759 ***	0.1882 **	0.409 **
4	0.8134**	0.426 **	0.4132 ***	0.426 **
5	0.8453***	0.759***	0.4320 ***	0.385 **
6	ns	ns	ns	ns
7	0.9161***	0.955 ***	0.3918 ***	0.396 **
8	1.0801***	1.112 ***	0.4056 ***	0.416 **
9	1.4730***	1.538 ***	0.4236 ***	0.737 **
Monthly net income	ns	ns	0.7483 ***	ns
Unemployed	-0.1962**	-0.332 ***	- 0.0054 **	ns
Number of sport infrastructures				
Indoor infrastructures	ns	ns	ns	ns
Outdoor infrastructures	ns	ns	-0.0049**	-0.004*
Swimming pools	0.0344*	ns	0.0251**	0.023*
Parcs	ns	ns	0.0027*	ns
Tennis courts	ns	ns	0.0421***	0.039**
Dance and gym halls	ns	-0.021**	ns	ns

*** Significant at the 1% level, ** significant at the 5% level, ** significant at the 1% level, ns: not significant.

From the table of output, we can see that, in line with the existing literature of the determinants of the sport demand in the United Kingdom and in the USA, the individual and sociological variables are highly significant.

The fact of being a man rather than a woman raises both the probability and the frequency of sport participation, this coefficient being more significant when considering the sport frequency. The two explained variables are increasing with age, but this relation is non linear, as shown by the significant coefficient attributed to the variable age square.

Interesting results have to be interpreted when we consider the origin of the person asked. Contrary to other econometric studies (Humphreys & Ruseski, 2007; Humphreys & Ruseski ,2009 and Downward, 2007) which distinguish the white from the black people or the Hispanic people, we had the possibility in our study of the sport participation in Munich to consider the country of birth of the person asked[4]. In a preliminary econometric analysis on the same data[5], we fund a negative sign of the coefficient of the variable "not German": being a foreigner reduces the probability of practicing sport and its frequency. Such a result leads to the following question: why? The choice of the a geographical distinction is based on a previous study on the determinants of the sport performance (Andreff, Andreff &Poupaux,2008) which showed that the probability to win an Olympic medal was determined, among other things, by the nationality of the athlete. We transposed the distinction of regions to our problematic, even if the explanations of the mass-sport participation are different from those concerning the high-level sport success. According to our results, we can see that Latin American people practice more sport and this more frequently than German people, the coefficient being significantly higher than the reference group which is defined by German people. The frequency of sport participation (according to the traditional poisson methodology) is also higher by foreign people coming from Western Europe and North America. On the contrary, the persons born in Eastern-European countries tend to practice less sport. So this classification shows that even if the non-German as a group practice less sport, this result is essentially due to the large group of inhabitants coming from Eastern-European countries. A more precise explanation to this phenomenon would to be found in considering the socio-economic characteristics of this group.

Finally, the height educational attainment levels have to be distinguished from the level 1, as most of their coefficients are significantly different from 0.

The economic variable "net monthly income" has a significant impact on the decision or on the frequency of sport participation only in one case. This result is in contrast with the results for the UK, where increased incomes reduce the frequency of sport participation. This also contradicts the theory according to which the sport demand would be an increasing function of the income, sport being considered as a normal good. In our study, the level of wealth of an household seems to have no impact on the sport practice. However, the fact of being unemployed has a significant and negative impact on the decision to practice sport and ambiguous impact on the frequency to sport participation. This result contradicts the consumer choice theory, according to which there

4

We preferred this distinction to that between black and white people, as the black people are highly underrepresented in Germany. The same argument applies for Hispanics.

exist a trade off between work and leisure. The choices of practicing sport as well as the intensity of the practice do not increase when the person is unemployed. Not having a job seems to be a barrier to the sport practice.

The number of the different types of sport infrastructures existing in the district seems to have no impact on the decision to practice sport but a significant and positive impact on the frequency of the sport practice. We can also note a negative impact of the number of outdoor infrastructures on the frequency of the sport practice. We can interpret this last result as following: the construction of one outdoor sport infrastructure would have no positive impact on the demand maybe because there is enough sport supply in these types of sports. Our first results on the impact of sport supply on sport demand are ambiguous, but these few interesting results motivate us to go further in this direction. The following step is to disaggregate our models to distinguish the different sports. A first attempt was done with the first method (disaggregate logit, poisson models). According to these preliminary results (see Tables 5 and 6 in appendix), we can see that this number of sport infrastructures has a positive and significant effect on the frequency of the sport participation in most of the cases.

4. Conclusion

The aim of conducting such an empirical study and building a theoretical model is not only to describe the behavior of households in the decision of sport practice, but also to predict the outcomes of political decisions and so be able to answer such a question: what is the percentage increase in sport participation when the number of infrastructures raises of Y % in a district of the city?

But before predicting outcomes, the following improvements of our models are necessary: we first have to add a very important explanatory variable, as soon as the collect of the data enables it: the sport associations supply, in its quantitative dimension (number of associations) as well as qualitative dimension (type of activity offered and for which population). In Munich, the population can choose between 6100 different sport activities, in 298 sport disciplines from 1100 public and private sport activity suppliers, among them 668 sport associations, and 302 commercial sport suppliers. It would be interesting to understand why people do not practice sport, which could be an additional invoice to conduct an adapted city-level sport politic.

Finally, it would also be suitable to ask us the question of the causality concerning the relationship between sport demand and sport supply.

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Appendix

Tab.5: The determinants of the decision to practice sport

Sport activity: YES or NO	Aquatic Activities	Dance and Gymnastic	Tennis	Outdoor sports activities	Walking and running	Indoor sports activities
Intercept	-2.1083***	-0.7391***	-4.1541 ***	-1.7698***	-2.5735 ***	-1.9206***
gender	0.2928**	-1.0693***	0.7683***	2.5799***	NS	0.9824***
age	0.00389*	NS	0.0079**	-0.0568***	0.0171***	-0.0283***
ethnicity	NS	-0.1542**	-0.349***	NS	NS	NS
Educational attainment	0.0291*	0.0742***	0.0739**	-0.0801***	0.0566***	0.0372**
Monthly net income	NS	NS	NS	NS	0,000**	NS
Unemployed	-0.2066 **	NS	NS	-0.8040***	-0.4436***	-0.4452 ***
Number of sport Infrastructures	NS	NS	0.0869 **	NS	0.0324***	NS

Tab. 6: The determinants of sport participation frequency

Sport participation: FREQUENCY	Aquatic Activities	Dance and Gymnastic	Tennis	Outdoor sports activities	Walking and running	Indoor sports activities
Intercept	-2.1455***	-0.5170***	-3.0037***	NS	-0.8394 ***	-1.2802 **
gender	-0.3284***	-0,088***	0.6541***	2.9217***	NS	0.6836 ***
age	0.0106***	0.0134***	0.0077***	-0.0877***	0.0065***	-0.0484***
ethnicity	NS	-0.1470***	-0.1869**	NS	-0.2977***	-0.2376***
Educational attainment	0.0570***	0.0482***	0.0510***	-0.0696**	0.0400***	NS
Monthly net income	NS	NS	0.0000***	-0.0000**	0.0000***	NS
Unemployed	-0.119**	-0.0698**	0.1741**	-0.2484**	NS	NS
Number of sport Infrastructures	-0.0002***	0.0141***	0.0455**	0.0164**	0.0179***	NS