

The income and price dependency of the Hungarian sport goods consumption

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Received 2011-01-07

Abstract

The aim of the paper is to study the relationship of individuals' sport goods consumption to personal income and relative sport price in Hungary in the period 1992-2006. It is shown, that the trend of the real sport goods consumption in conjunction with real income decreased till 2000 and it has been increasing since then. Income and price elasticity figures for both periods show, that sport goods consumption is price elastic, and sport goods are luxury goods for Hungarian households. Thus, without increased income – i.e. the average standard of living – a more sport conscious Hungarian population can hardly be imagined even if sport goods remained relatively cheap.

Keywords

sport goods consumption · net income · income elasticity · price elasticity

1 Introduction

Hungarian population does not do sport to an extent, which can have a major recreational and preventive effect [3, 4, 6, 10]. This is not surprising, because recreational sport was not in the centre of sport politics during the socialist era, and the vast majority of the society was not socialized on sports. This lack of responsiveness determines the current low level of activity, which is reinforced by low standard of living and lack of leisure time [5].

Externalities of recreational sport consumption can be (1) longer life thanks to better state of health, (2) longer participation in production, (3) increasing performance of the labour force – which is verified by the 2.8 percentage increase of the labour force productivity if adult survival rate increases by 1 percentage [2] – (4) decreasing number of sick days, (5) decreasing costs of absenteeism and presenteeism, (6) increasing corporate performance and the improving labour market situation [1, 8].

Recreational sport of the population can be financed by the public and the private sector. Expenditures on sport should be distinguished in the private sector as follows: expenditures of companies operating in competitive sector and expenditures of households. Keserű and Dénes [6] estimate the expenditures on sports of the Hungarian population representing 0.43% in the total household spending, which rate is for example only a quarter of the French value.

When people talk about sport consumption, sport products – sport goods, sportswear, etc., that are associated with sporting activities – and sport services – which has been used for individuals in pursuit of sport – can be distinguished. There are a number of factors that affect on the sport consumption. Some new elements affecting the demand for sport consumption near the classical determinants of demand, because sport is cultural good¹ [7]. Price, income, spare-time, individual preferences and their relationship, education and occupation, costs of obtaining information, transportation and understanding can be mentioned among the determining factors of sport consumption. Prestige consumption can predominate too. Within the category of sport

¹Sport is a part of culture. Culture includes all the learned convictions, values and habits, which direct the consumers' behavior.

products the paper deals with the part of sport goods consumption linked to public recreational sport financed by the households themselves.

The research is seeking answers to the following questions: what trend prevails in the Hungarian population's sport goods consumption, and what role prices and household incomes play as demand determining factors.

2 Methodology and data

This paper wants to identify the income and price elasticity of sport goods. Our hypothesis is, that it would be justified, to consider sport goods as luxury goods, because Hungarian people had not socialized enough to live health and sport conscious lifestyle and doing sports is linked to higher level of income and a higher level of social status. It means that a one percent increase in incomes brings more than one percent increase in consumption of sport goods.

The research is based on the household surveys of the Central Statistical Office (CSO) between 1992 and 2006. The data are comparable in this period despite the fact that the CSO has used the United Nations Classification of Individual Consumption by Purpose (COICOP) groupings from 2000. The content of the pre-1992 methodology was different from the subsequent period. The post-2006 data were not available at the time of preparation of the research.

Measuring of recreational sports-related expenses is carried out by "sport- and camping goods" data (later sport goods consumption data), which include all expenses on sport goods and sport equipments. However, there are other sport-related expenses in COICOP grouping, but these are related to entrance fees of sport events or these can not be isolated from other cultural expenses, so these can not be used for measuring the expenses related to active sport life. Sport goods consumption is defined within narrow bounds in this paper and it covers only the consumption of sport equipments. The measures of household income are the data of per capita disposable income (later income data).

The available data were calculated for the 2007 base-year values. The values of „sport- and camping goods" were deflated by the consumer price index of „sport goods and games", the values of „net income " were deflated by the aggregated CPI.

The analysis was performed by econometric modelling tools. A trend analysis was made on sport goods consumption, income and relative price data. Our assumption was, that curves of income and sport goods consumption are similar, because influence of living standards is crucial for the sport goods consumption.

The income- and price dependency of demand for sport goods consumption were measured with regression modelling. These tools of analysis make it possible to analyse data in long term and to analyse partial effects of the two determining factors onto the expenses related to sport goods. For calculations econometrical program GRETL 1.8.0 was used.

3 Empirical results

Several models were fitted on the data of real sport goods consumption between 1992 and 2006, from which the quadratic model was the best (Fig. 1). The quadratic function takes a U-shape, which is broken in year 2000. Therefore the D2000 dummy-variable was included into the model. All the variables were significant at a 1% significance level (Tab. 1).

A similar trend of the net income data can be seen between 1992 and 2006, as a result of which the quadratic model proved to be the best, and the dummy-variable 2000 was applied in this case too, because there was a breakpoint in the U-shaped function (Fig. 2). The variables were significant at a 1% significance level (Table 2). The reduction of living standard is represented by the downward phase of the net income trend. The nadir came at the late 1990s, and from that time living standards began to increase.

The two trends are very similar, despite the fact that the D2000 dummy-variable has an opposite sign in the two models. The two trends move closely together. The only difference between the two trend lines was in the year 2000, which could be guessed at their separated analysis, because the variable D2000 has a positive sign at the income-trend and it has a negative sign at the sport goods consumption-trend (Fig. 3).

Sport goods consumption is fundamentally linked to the living standard. The increasing demand for sport goods moves together with the increasing net income. However there is a significant difference between the two trends. There was a significant jump in living standards in the year 2000, while sport goods consumption significantly decreased in that year. The demand for sport goods has already risen sharply after the year 2000.

Examining the relative price change of sport goods consumption articles a linear trend line can be fitted onto the data and a permanent decline can be seen (Fig. 4, Table 3). The relative price was calculated as the quotient of the consumer price indexes of sport goods consumption and aggregated consumption. That means, that sport goods consumption became cheaper during the analysed period, because the sign of the changes is negative in all years. However, the trend showed that this decreasing had an increasing rate in longer term, but it is less important in our analysis.

In our further analysis the data were examined by regression modelling, to show the impact of income and price on the demand for sport goods consumption: the elasticities were examined with modelling, which resulted in partial elasticities of a continuous function.

The D2000 dummy-variable was used for the construction of the regression model like in the previous trend analysis models. The income and the relative CPI variables were used as explanatory variables. We applied a loglinear function specification in our analysis, which is the generally accepted specification at the regression modelling of demand functions. We tested some other specifications too, and it seemed to be the best based

Tab. 1. Quadratic trend estimation of the real sport goods consumption. const: constant, year2: quadrate of the year, D2000: dummy-variable of the period after year 2000

Variable	Coefficient	Standard error	t-value	p-value
const	1.61164e+07	2.70285e+06	5.9627	0.00009 ***
year	-16136.8	2704.87	-5.9658	0.00009 ***
year2	4.03937	0.676724	5.9690	0.00009 ***
D2000	-150.342	44.9907	-3.3416	0.00657 ***

F-value (3, 11) = 14.2141 (*p*-value= 0.000421)
*R*²-value= 0.794938
 MAPE= 14.22%

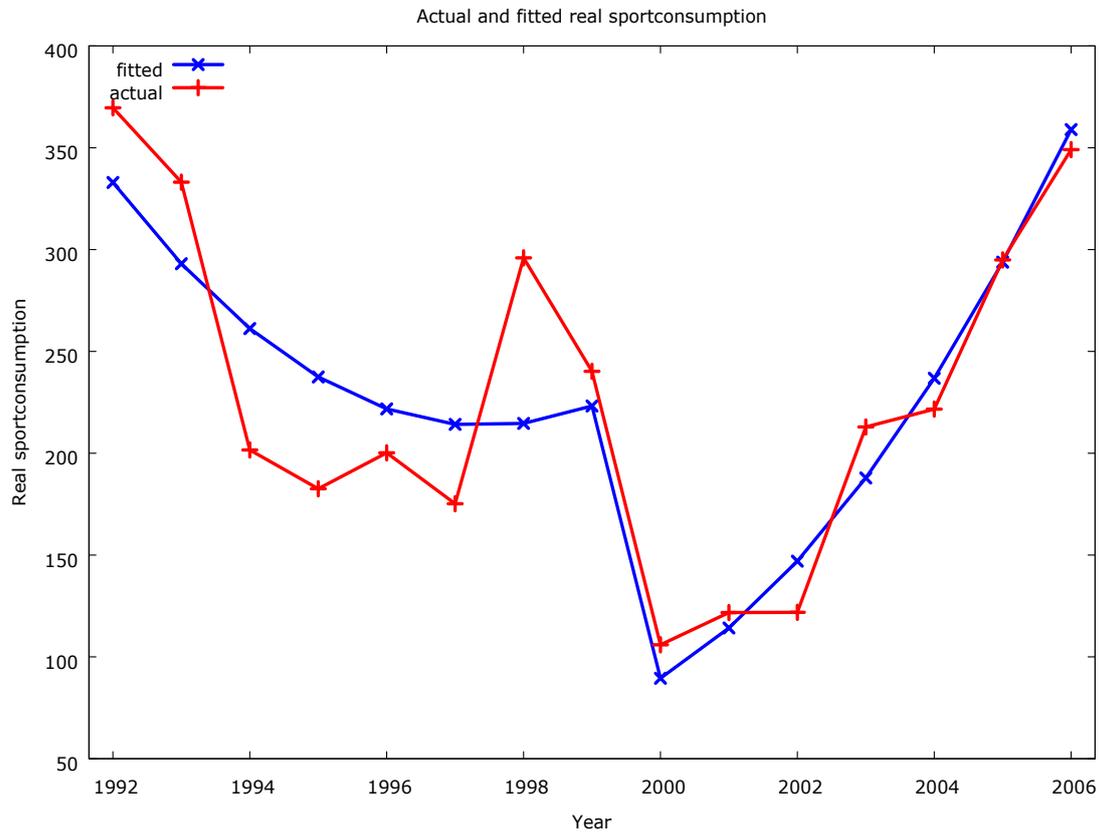


Fig. 1. The trend of the real sport goods consumption

Tab. 2. Quadratic trend estimation of the real incomes. const: constant, year2: quadrate of the year, D2000: dummy-variable of the period after year 2000

Variable	Coefficient	Standard error	t-value	p-value
const	803698	30022.9	26.7695	< 0.00001 ***
year	137289	34059.5	4.0309	0.00198 ***
year2	-75453.3	8612.17	-8.7612	< 0.00001 ***
D2000	5114.42	512.303	9.9832	< 0.00001 ***

F-value (3, 11) = 79.31626 (*p*-value < 0.00001)
*R*²-value= 0.955814
 MAPE= 3.43%

Tab. 3. The trend of changing in the relative price of sport goods consumption (%)

Variable	Coefficient	Standard error	t-value	p-value
const	-1.37457	0.828325	-1.6595	0.12291
time	-0.195469	0.0880499	-2.2200	0.04644 **

F-value (1, 12) = 4.928290 (*p*-value < 0.046441)
*R*²-value= 0.291127

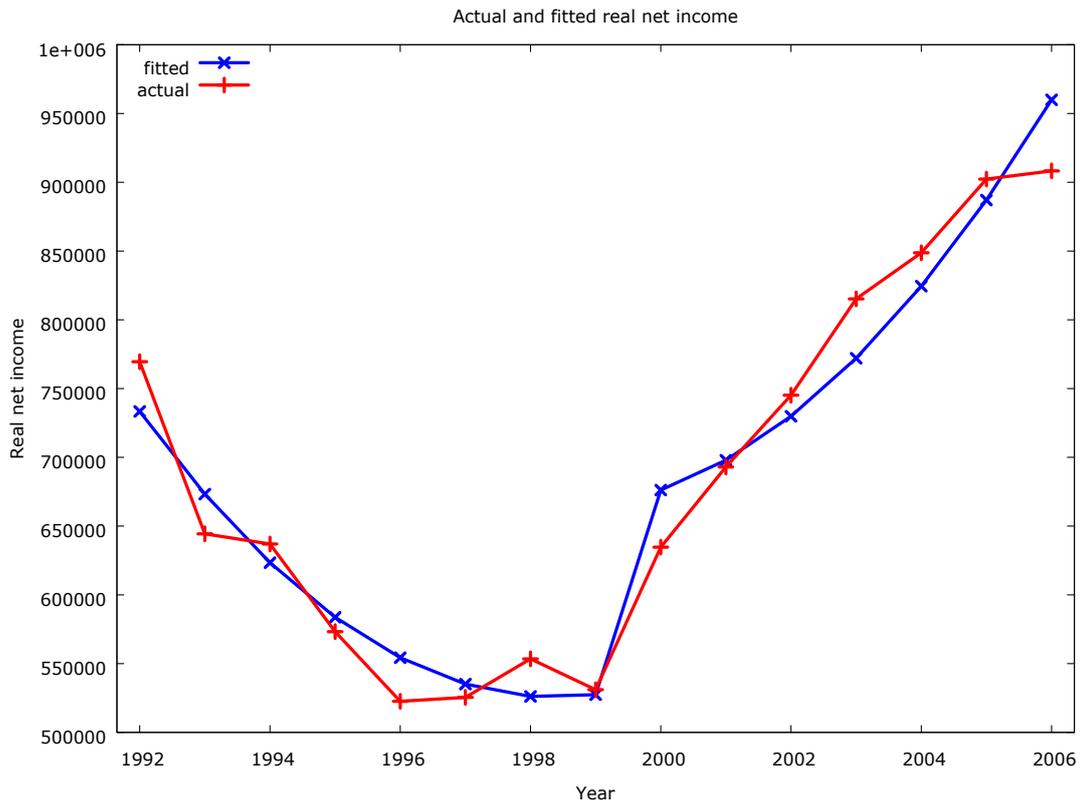


Fig. 2. The trend of the real net income

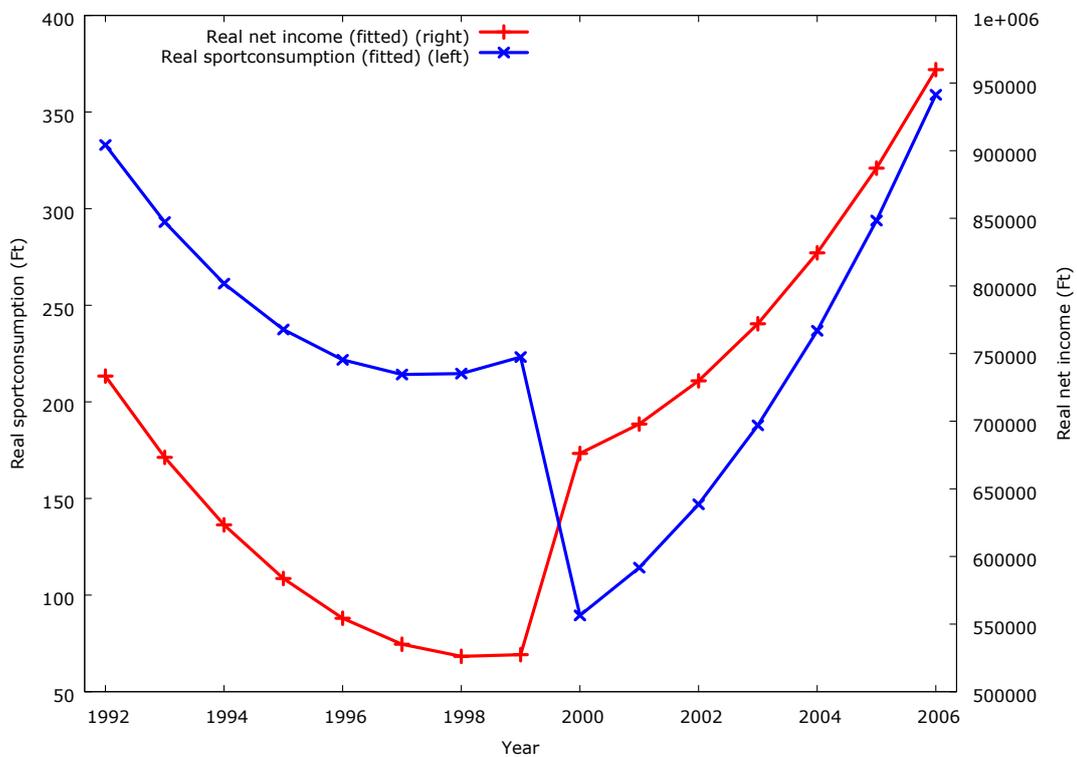


Fig. 3. Trends of real sport goods consumption and real net income

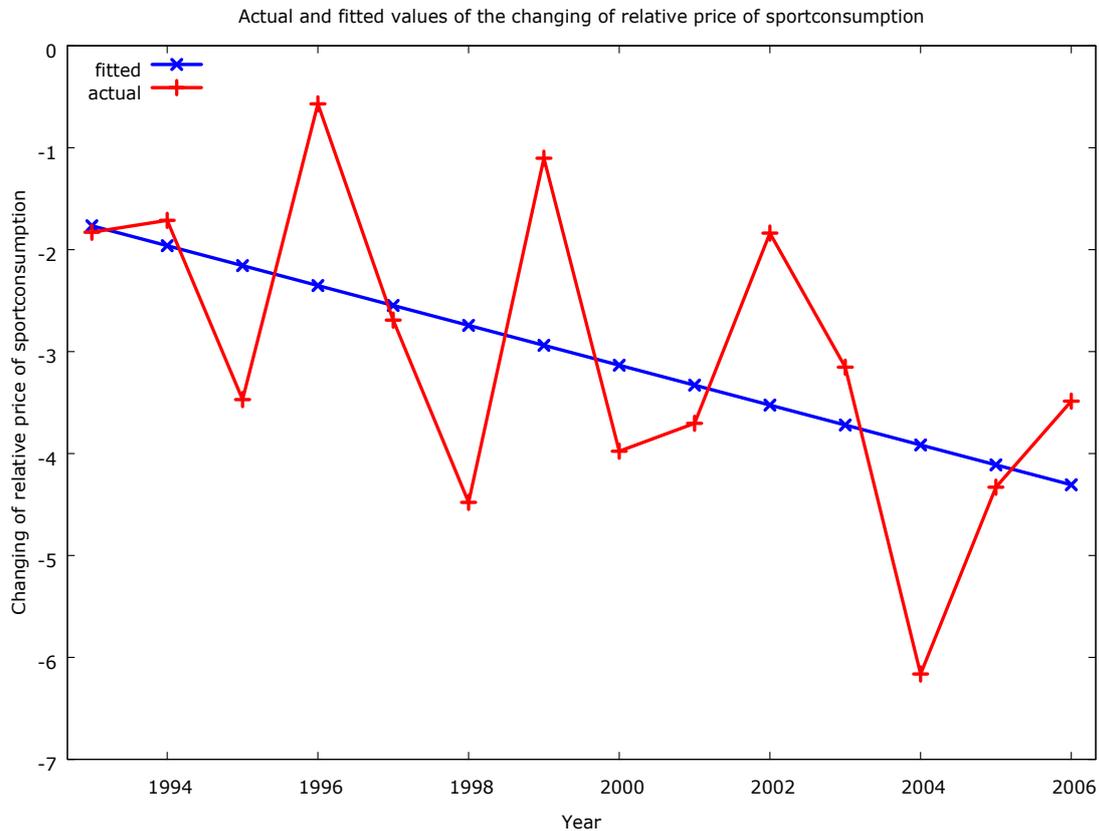


Fig. 4. The changing of the relative price of sport goods consumption (%)

on model specification criteria. The advantage of this specification is, that the coefficients of the variables can be read as the partial elasticity data. The model includes the explanatory and explained variables in logarithmic form, with the exception of the dummy-variable [9]. The model equation is the following (Eq. 1, The equation of sport goods consumption model):

$$\begin{aligned} \ln(\text{sport_real}) = & -21.5239 + 2.10426 \cdot \ln(\text{inc_real}) \\ & - 2.30372 \cdot \ln(\text{q_spcpi07_cpi07}) \\ & - 1.38281 \cdot \text{D2000} \end{aligned} \quad (1)$$

where:

sport_real: real sport goods consumption (HUF)

inc_real: real net income (HUF)

q_spcpi07_cpi_07: quotient of the sport goods CPI and the aggregated CPI, the relative price of sport goods consumption with base year 2007

D2000: dummy-variable of year 2000.

The demand-model fits well, 84% of sport goods consumption is explained. The value of mean absolute percentage error of the model is 2.12% (Table 4). These data show that this demand-model is able to simulate the trend of sport goods consumption with a low percent of error. This means, that sport goods consumption can be forecasted using these two main factors of demand. The explanatory variable of relative prices had

a negative sign, i.e. if sport goods become more expensive, then the demand will decrease.

After the modelling we can establish, that Hungarian people expend more on sport goods at a higher level of income. It could mean, that they do the same sports as at lower level income but with better and more expensive equipment (e.g. brands with higher quality) or they do other sports at higher level of income, which need much more expenses on sport goods (e.g. golf).

The coefficient of price variable has a negative sign in the model, if sport goods become relatively more expensive then demand reacts with a decrease and vice versa. Sport goods react on the relative price change as ordinary goods, so the demand curve of these goods has a negative slope.

Since the coefficients of the variables are the same as the partial elasticities, we had to test these values, whether they differ significantly from one. The aim of this test is to verify, whether the partial elasticities are not unit elastic. On the other hand the loglinear model tests the diversity of the values from zero, so we did not need to test it again. The formal null-hypothesis is, that the coefficients are 1. The test statistics are the following Eq. (2). Test statistics of the formal null-hypothesis:

$$t_0 = \frac{\hat{\beta} - 1}{s_{\hat{\beta}}} \quad (2)$$

where:

t₀: t-value, test statistics

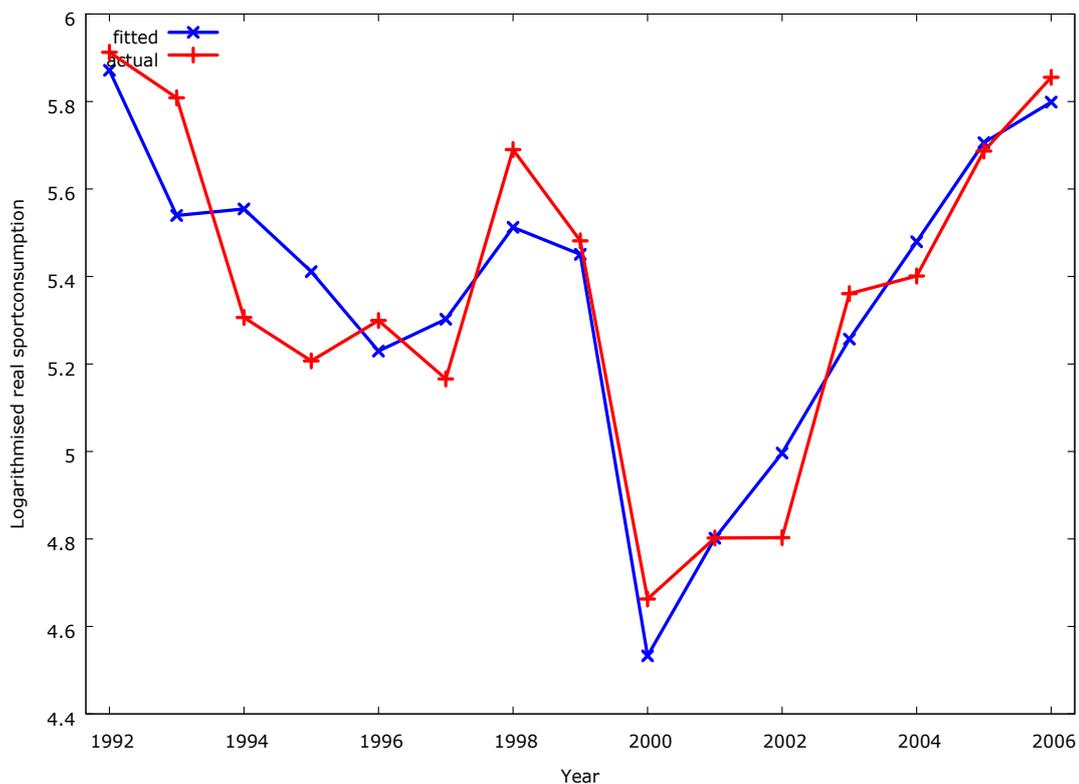


Fig. 5. The graph of the demand-model of sport goods consumption

Tab. 4. The loglinear demand-model of the sport goods consumption (1992-2006). const: constant, D2000: dummy-variable of the period after year 2000, l_inc_real: logarithm of the real net income, l_q_spcpi07_cpi: logarithm of the quotient of sport goods CPI and aggregate CPI on the base of year 2007

Variable	Coefficient	Standard error	t-value	p-value
const	-21.5239	4.65863	-4.620	0.0007 ***
D2000	-1.38281	0.187884	-7.360	0.00001 ***
l_inc_real	2.10426	0.346478	6.073	0.00008 ***
l_q_spcpi07_cpi	-2.30372	0.673154	-3.422	0.0057 ***

F-value (3, 11) = 22.03128 (*p*-value= 0.000059)
*R*²-value= 0.857317
 MAPE= 2.20558%

$\hat{\beta}$: original coefficient of the observed variable in the loglinear demand-model

$s_{\hat{\beta}}$: original standard error of the observed variable in the log-linear demand-model.

Tab. 5. Testing the diversity of the partial elasticity values from unit elasticity

Elasticity	Value	t-value	p-value
Income	3.1871	3.106	0.00499 **
Price	-4.9078	4.437	0.00023 ***

Based on the results it can be concluded, that the values of both the income and price coefficients are in absolute terms greater than one, so sport goods consumption is income elastic and price elastic in the model. However, the price elasticity value has a negative sign, which justifies the economic assumption, that an increase of the prices reduces the sport goods consumption.

Based on the income elasticity data sport goods can be reported normal goods, moreover they are luxury goods. So demand for sport goods increases with a higher rate than the growth rate of net income. The model shows, that a 1% increase in income results a 2.10% increase in consuming sport goods. This observation reinforces the conclusion that Hungarian people expend more on sport goods if their incomes have increased. The luxury goods are not luxury goods at all levels of income. Often, when an individual's income reaches a certain level, he changes the structure of his expenditure, and the former luxury good becomes necessity good. In this case the individual will not increase his consumption with such a rate as his income grows. However, the income of the Hungarian population still seems to be far from this level, thus sport goods are luxury goods at the present time.

Based on the price elasticity analysis sport goods are price elastic and have a negative sign. The model shows, that a 1% increase in relative price index of sport goods results in a 2.30% decrease in consuming sport goods.

4 Conclusions

The research found, that households' sport goods consumption and net income trends can be characterized with a U-shaped curve. Trend analysis verified, that the decrease of living standards had coincided with the decrease of sport goods consumption after the change of regime in the 1990s. The Hungarian living standards increased from 2000 and it pulled the sport goods consumption too. An additional result was, that sport goods became relatively cheaper during the analysed period, their CPI increased with a smaller ratio than the aggregated CPI did.

Based on the sport goods consumption demand-model – in which prices, net income and a dummy-variable representing the period after 2000 are the determinants of the sport goods consumption – it can be concluded, that price and income have determining roles among the elements of behavioural model of sport consumption [7].

However sport goods consumption became relatively cheaper and cheaper during the whole analysed period, it had not enough effect to compensate the effect of decreasing income in the 1990s – this is shown by the trends of income and sport goods consumption. The effects of increasing income and further decreasing of relative price resulted increasing sport goods consumption after 2000.

Our null hypothesis was true, sport goods are luxury goods for Hungarian people at present income level and preference scale. This fact is absolutely unfavourable taking the health status of Hungarian population into consideration. It would be desirable to recognize for everybody, that doing sports is the base of healthy life, so Hungarian people should devote relatively more money to recreating themselves. It would be ideal, if sport goods were necessity goods, but it seems to be totally idealistic at the present level of Hungarian average incomes.

The research did not deal with the different income clusters of Hungarian people and their special sport goods consumption. Different income clusters may have different structure of sport goods consumption at the same time and it may be different from the average consumer's preferences. Of course the income and price effects in the different clusters can be diverse. The next step of further research can be to analyse these single clusters.

Income-elastic sport goods do not mean an income-elastic time spending on sport activities, so it is impossible to calculate the typical Hungarian consumer's time-use on the basis of this paper. Maybe more expenses on sport goods represent surplus time spending on sport activities, but maybe the structure of sport activities changes and it shifts to activities with more expenses, which does not mean more time-spending (extremely it goes together less time-spending). Sport activities are free-time activities. There is a trade-off effect between free-time activities and working activities. The price of free-time activities are not only its concrete expenses, but the dropped out wages, which are opportunity costs too. If we would like to study the time-use of sport activities, we should pay attention to this effect.

Choices of consumers affect back onto their well-being and their state of health too. Choices of individuals are results of private decisions, which are influenced by experiences, observations and information. Perfect rationality in microeconomics is only a simplifying assumption and it does not succeed in real life. However majority of people have enough information about role of sport developing healthy life, but they do not enforce this knowledge in their real life (only 23% of Hungarian population exercise sport regularly or with some regularity) [3]. Government and some authorities have the possibilities and experts to change this preferences and contribute to a healthier Hungarian society.

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