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Cahier de recherche

The Demand for Football in Switzerland: An Empirical Estimation

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Cahier : N° HES-SO/HEG-GE/C--08/1/1--CH

2008

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Janvier 2008

Abstract

This paper identifies the factors determining the attendance at football games in Switzerland. Our data covers three seasons of the top division of the Swiss football league, between 2001 and 2004, which includes a major revision of the championship rules in 2003-2004. We were able to gather a high amount of information, allowing us to take into consideration several factors not always accounted for simultaneously in the literature, such as ticket price, capacity constraint, TV coverage, as well as more traditional factors like uncertainty. In order to cope with problems imposed by capacity constraints as well as the panel dimension of the data, we make use of a random effects Tobit model. Among others, our results show that TV coverage does not have a significant impact on the number of spectators, and, except for FC Basel, the price-elasticity is relatively low, which indicates that football clubs could raise their gate revenues by increasing ticket prices. Furthermore, the new championship formula did clearly raise attendances.

Keywords

Demand for sport, attendance, football, censoring, Tobit estimation.

JEL Classification L83, C24.

Acknowledgements

We thank the Federal Office of Meteorology and Climatology MeteoSwiss, the Swiss Federal Statistical Office and the Marketing Committee of the Swiss Football League for providing us with most of the data used in this paper. The usual disclaimer applies.

Résumé

Cet article identifie les facteurs déterminant le nombre de spectateurs assistant aux matchs de football en Suisse. Nos données couvrent trois saisons du championnat de première division, entre 2001 et 2004, avec une réforme majeure dans la formule du championnat en 2003-2004. Les nombreuses informations statistiques récoltées nous permettent de tenir compte d'un grand nombre de facteurs qui ne sont pas toujours considérés de manière simultanée dans la littérature, tels que le prix des places, les contraintes de capacité des stades, la couverture TV, ou encore des facteurs plus traditionnels comme l'incertitude. Afin de tenir compte des problèmes économétriques engendrés par les contraintes de capacité et la dimension longitudinale des données, nous utilisons un model Tobit à effets aléatoires. Nos résultats montrent en particulier que la couverture TV n'a pas d'impact important sur le nombre de spectateurs et que, sauf pour le FC Bâle, l'élasticité-prix du nombre de spectateurs est relativement faible en valeur absolue. Par conséquent, aux niveaux de prix pratiqués dans cette période, les clubs pourraient accroître leurs recettes en augmentant les prix d'entrée. De plus, la nouvelle formule du championnat a clairement augmenté le nombre de spectateurs.

Mots-clés

Demande pour le sport, spectateurs, football, contraintes de capacité, estimation Tobit.

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1. Introduction

Comparing attendances at football games in Switzerland with figures in other European championships clearly shows that Swiss football does not attract many people, even though football remains the most popular sport, with ice hockey.[1] Attendances are indeed very sparse, with relatively few exceptions. Increasing the audiences requires knowing why people come to watch football. The purpose of this paper is precisely to analyse the factors having an impact on gate attendances, or in other words to estimate the demand for Swiss soccer. Our data covers three seasons of the top tier Swiss football, from 2001-02 until 2003-04. Since this championship is rather untypical and has been modified during this period, it is worth explaining its functioning with some details.

Until season 2002-03 included, the Swiss football's top division was called *National League A* (*NLA*), and became the *Super League* from season 2003-04 on. This revision is not only cosmetic, since the number of teams playing in the top league was reduced from 12 to 10 and the functioning of the championship was heavily altered.

Under the *NLA* system, the season was split in two parts: the "Qualification Round" (QR, from July to December) and the "Final Round" (FR, from February/March to May). During the QR, 12 teams played two complete rounds (11 home games for each). Afterwards, the bottom four teams were removed and had to compete against relegation with the top four of the *National League B* (the former Swiss football's 2nd division) for the rest of the season. The top eight teams were qualified for the FR, where two complete rounds were played again (7 home games for each). Before the beginning of the FR, the points of every qualified team were divided by two.[2] The standings at the end of the QR were used to rank teams having the same number of points during the FR instead of the usual goal average criterion. From the moment they had qualified for the FR, teams had absolutely no risk of being relegated at the end of the current season and thus only struggled to be the Swiss champion and in order to participate to UEFA's championships. Near the end of the season, teams lying between ranks four and eight often played games without stakes at all since nothing would happen, did they win or lose.

The new championship system is much simpler. The 10 teams engaged in the *Super League* play four complete rounds (18 home games for each) during the whole season (from July to May with a break from December to February). At the end of the four rounds, the first team is champion and the last is relegated in *Challenge League* (the new 2nd division, which was adapted at the same time). The last but one competes against relegation with the second of the *Challenge League* (who seeks to be promoted) under the cup system, on a home-and-away basis.

The revision of the championship's formula probably induced some changes in the way people view football in Switzerland, and consequently it probably had an impact on the demand for this sport. Firstly, one can notice that the functioning of the *NLA* was quite complicated. The simplification brought by the *Super League* has surely been welcomed by some spectators, who may have lost interest because of such a complexity. The division of the points was not viewed as very fair since teams having performed well at the beginning of the season were in some way "robbed" part of their benefit. However, this mechanism was surely introduced in order to increase uncertainty by tightening the spreads between teams after two rounds. Finally, another improvement of the new system is that each team now plays

[1] Switzerland has a permanent resident population of about 7.5 millions.

[2] One point was "offered" to teams having an odd number of points before the division so as not to have half-points thereafter.

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important matches until the end of the season, be it for the win of the championship, for the second and third positions that give access to the UEFA Champions League and UEFA Cup, or against relegation.

To the best of our knowledge, only Flückiger and Manzini (1991) have analysed the demand for football in Switzerland. These authors used data concerning one season of the *National League A* (1989-90) only, and their explicative variables are relatively few. Since we gathered much more information, our study will bring additional results about the factors determining attendances at football games in Switzerland. Moreover, since our data covers three seasons of the top division of the Swiss football championship, our results are expected to be more robust. In addition, we are able to test the impact on attendance resulting from a major revision in the formula of the Swiss football championship (from *National League A* to *Super League*).

The international literature on football economics is much more developed, with the majority of studies referring to the biggest European championships. Among the most recent papers, see Garcia and Rodriguez (2002) for the Spanish championship; Forrest, Simmons and Szymanski (2004), Forrest, Simmons and Buraimo (2005) and Forrest and Simmons (2006) for the English championship; Czarnitzki and Stadtmann (2002) for Germany; Falter and Pérignon (2000) and Falter, Pérignon and Vercruysse (2007) for France. Nevertheless, the majority of the studies do not focus on estimating a demand for football, but rather on the impact of outcome uncertainty and on the correct manner to model it. However, uncertainty only constitutes a single determinant of gate attendances among many others. Football authorities only have a very limited control on uncertainty and it is thus useful to identify other factors susceptible to be more easily monitored and controlled for, such as ticket pricing. In addition, we should note that the existing literature does not pay sufficient attention to the statistical problems inherent with attendances data. As explained by Dobson and Goddard (2001, pp. 321-324), "the treatment of ground-capacity constraints seems to be one of the least satisfactory aspects of the empirical sports attendance literature".

By comparison with previous studies in Switzerland and abroad, our paper is original in several respects. Firstly, we were able to collect many variables and to consider them simultaneously in order to quantify their impact on attendance. Moreover, we investigate whether the revision in the championship's formula affects attendances. Eventually, we carefully apply econometric techniques in order to account for the panel dimension of the data, without neglecting the capacity constraints. As far as we are aware of, such a careful estimation of football attendance has never been done in the sport economics literature.

The remainder of the paper is organised as follows. The next section presents the collected variables and offers some descriptive statistics. Section 3 presents the model, discusses the difficulties when dealing with attendance data, and specifies the econometric approach. In section 4 we discuss the results, while section 5 concludes.

2. Football demand variables and descriptive statistics

We were able to collect numerous variables which can influence the audience of football matches. These variables can be classified in seven categories: socio-economic conditions; weather and geographic conditions; schedule of the game; substitutes; team performance; rivalry between teams; and outcome uncertainty (see Table 1).[3] Of course, some variables in Table 1 can be influenced directly or indirectly by the Swiss Football League and football authorities, while others (e.g. the socio-economic conditions) cannot be controlled for.

[3] The complete list and descriptive statistics of all the collected variables can be obtained from the authors upon request.

Table 1 Variables definition

Variable	Description
i. Socio-economic conditions	
Unemp	Rate of unemployment in the canton
ii. Weather and geographic conditions	
Sun	Minutes of sunshine in the hour preceding the beginning of the game
Dist	Distance between teams' cities (km)
iii. Schedule	
Sunday	Sunday
Midafternoon	Game played between 4 and 6 p.m.
Television	Game televised
Cap	Stadium capacity
Age	Stadium age (= current year minus year when the stadium was built)
Hockey	There is a team of the same canton in the top tier Swiss ice hockey league
iv. Performance	
GoalHF; GoalHA	Total of goals for; against home team before the game, respectively
Leader	Visiting team is the championship leader
v. Rivalry	
Derby	Game between two teams of the same canton + LS vs. SFC games[4]
French; German	Game between two teams of the same linguistic region (French or German part)
vi. Outcome uncertainty	
Adapted Kuypers	[number of games left until the end of the championship] times [number of points the home team trails behind the leader]
Forrest's outcome uncertainty	Absolute value of [Home advantage plus points-per-game to date of the home team minus points-per-game to date of the away team], where Home advantage = mean points-per-game achieved by all home teams in the previous season minus points-per-game achieved by all away teams in the previous season

Among the list of variables, we observe two variables measuring two types of uncertainties: one related to the individual match and the other related to the championship. For the uncertainty of outcome at the individual game level, we use the measure proposed by Forrest et al. (2005). This measure is interesting, because it accounts for the fact that teams playing at home typically possess a higher winning probability. As in other countries, we can indeed observe in Table 2 that home teams in Switzerland win twice more often than away teams. A direct consequence is that games between teams having almost the same standings are not the most uncertain, since in this case the probability that the home team wins is higher. By contrast, uncertainty of outcome is greater when the home team ranks lower than the host team. In this case, the home team advantage may be compensated by differences in the teams' strengths, and thus the outcome of the game is more uncertain. On this basis, Forrest et al. (2005) define the "home advantage" as the difference between points per game won by all home teams and points per game won by away teams in the previous season. Their measure of outcome uncertainty is then defined as the absolute value of the "home advantage" plus the

[4] Games between Lausanne (LS) and Servette-Geneva (SFC) are often called the "lemanic derbies", since the two cities hosting these clubs are located on the shore of the Leman lake (Geneva lake).

home team's points per game minus the away team's points per game in the current season. Uncertainty is zero when the home advantage exactly compensates the superior playing records of the visiting team. The lower the value of the outcome uncertainty measure, the higher the uncertainty of the match.

For uncertainty at the championship level, we refer to the well-known Kuypers' measure (Kuypers, 1996), which is given by the product between the number of games left until the end of the championship and the number of points the (home) team trails behind the leader. Kuypers' measure is equal to zero when there is no more mathematical possibility for the team to win the championship. The literature seems to indicate that the Kuypers' measure is diminishing with seasonal uncertainty, but this is only partially correct. Indeed, setting the measure to zero when a team has no more chance to win the championship is problematic, since it implies that a game between two leaders having the same number of points (Kuypers' measure = 0) is as uncertain as a game between the last two teams who have no chance to be champion anymore. Moreover, even when the championship is lost, there is still some uncertainty concerning the rankings qualifying for European cups or to fight against relegation. We thus define an "adapted" Kuypers' measure as the product of the number of games left until the end of the championship and the number of points the teams trails behind the leader (until the end of the season for every team). According to this definition, the adapted Kuyper's measure is inversely correlated with seasonal uncertainty and it is equal to zero when uncertainty is maximal.

Table 2 reports the descriptive statistics for the final sample used in the estimations. From Table 2 we can immediately see that the Swiss football clubs face very different socio-economic and infrastructure conditions. For example, the mean stadium capacity is 17'977 spectators, but the standard deviation is 8'209, with a minimal value of 6'663 and a maximal of 32'728. This fact is well illustrated by the left panel of Figure 1, where one can see that FC Basel is clearly a special case. In fact, the new stadium, one of the first modern ones built in Switzerland, was opened in the season 2000-2001, i.e. the season just before the period under study in this paper. Moreover, during the season 2002-2003 the FC Basel was the first Swiss team that went through the "Champions league" group stage, even managing to defeat some big European clubs like Juventus and obtain draws against Liverpool or Manchester.

The mean attendance over the whole observation period is 9'467, with a range going from 1'050 to 33'433 spectators. As shown by the right panel of Figure 1, the highest mean attendance has been observed during the Final Round of season 2002-03 (11'477)[5] and the lowest during the Qualification Round of the season 2001-02 (7'721). Figure 1 inspires some preliminary mitigated comments about the effect of the new championship formula. Even if attendances were quite higher during the first part of the season (Qualification Round vs. Autumn Round), the second part of the season (Final Round and then Spring Round) appears less attractive than in the past. One a priori explanation could be that the number of participants being smaller in the Final Round (8) than in the Autumn Round (10), only the biggest teams were able to stay in this championship whereas in the new system, any little team engaged in the championship stays in until the end. However, since other factors influence attendance, we have to wait until the results of the empirical section to judge the actual impact of the new championship formula.

Entrance fees are relatively heterogeneous, with the seated ticket price going from 15 to 40 Swiss francs.[6] We obtained the ticket prices data from the Swiss Federal Statistical Office (SFSO) that collects them in the frame of the consumer price index (CPI). Not all the teams are located in regions taken into account in the CPI, and this is why there are less than the

[5] But note that the highest median is to be found in the Autumn Round of season 2003-04.

[6] Currently CHF 1 = EUR 0.6 = USD 0.85.

initial 556 observations. Because not all stadiums still provide standing tickets, we choose to retain only the seated ticket price. There are nevertheless several prices for seated tickets in each stadium (depending on e.g. the proximity with the field and the quality of the seat), and we therefore consider the lowest possible price, assuming that everyone going to the stadium had the possibility to buy one of those.

Table 2 Descriptive statistics for the 3 seasons 2001–2004 (11 teams, 12 stadiums, 428 observations)

Variable	Mean	Std. dev.	Min	Max
Attendance	9'466.862	7'439.289	1'050	33'433
Stadium capacity	20'216.710	7'705.910	9'250	32'728
Price (seated)	26.694	8.092	15	40
Television	0.201	–	0	1
Hockey	0.671	–	0	1
Kuypersh	195.942	169.089	0	744
Uncertainty	0.950	0.626	0.011	3.830
Home win	0.530	–	0	1
Away win	0.250	–	0	1
Draw	0.220	–	0	1
GoalHF	29.269	20.890	0	92
GoalHA	25.801	16.410	0	70
Derby	0.049	–	0	1
Dumleader	0.086	–	0	1
German	0.484	–	0	1
French	0.047	–	0	1
Distance (km)	115.161	64.548	0	281.605
Sunday	0.350	–	0	1
Sun	23.710	25.081	0	60
Age (years)	58.876	32.032	0	97
Unemp rate	3.346	1.389	0.998	6.964
New formula	0.336	–	0	1
Midafternoon	0.388	–	0	1

As already mentioned, the proportion of home wins is quite important, with more than 50% of all games ending in a victory of the home team (but only 43.4% in the QR 2001-02). The proportion of away wins is 25% (lowest proportion in the FR 2002-03 with 17.1%), and those of draws 22% (lowest proportion in the AR 2003-04 with 16.7%).

As compared to bigger European championships, the broadcasting covering is low. Over the three seasons under study, only 20% of the games have been broadcasted live (for free). Under the old championship system, fixtures of the FR were much more televised than those of the QR: 33% of the games of the FR 2001-02 (44% in FR 2002-03) were covered, but only 18% of the QR fixtures (13% in QR 2002-03). With the new formula, the covering is more homogeneous along the season (14% of the AR and 17% of the SR). However, some teams are much more televised than the others. Over the three seasons, 35% of the televised games displayed the FC Basel as home team and 41% as away team. Grasshoppers Club Zürich (37% at home and 37% away) and Young Boys Bern (28% and 23%) have similar coverage. In fact, those three teams taken together appeared in 85% of all the games that have been broadcasted during the three seasons. On the other side, teams like FC Aarau (6% at home and 6% away) and Neuchâtel Xamax (9% and 9%) are scarcely shown. As we will see in section 3, the television variable is not usable as such. Since games selected for broadcasting are the most attractive ones, we face an obvious problem of endogeneity: broadcasted matches are also those where attendances are the greatest. Broadcasters may in addition be reluctant to

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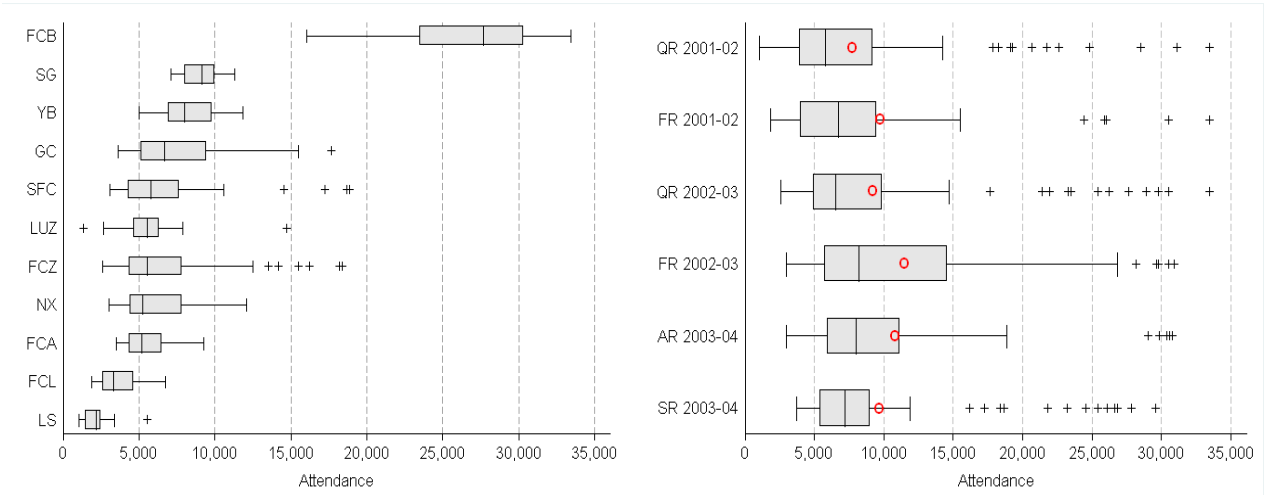
show games in an almost empty stadium. To keep the *Television* variable instead of simply dropping it, we will use an instrument variable.

Figure 1 Attendances by home team and by season



Notes:
- The non-abbreviated names of the teams can be found in Table 7 in Appendix.
- QR = Qualification Round, FR = Final Round, AR = Autumn Round and SR = Spring Round.
- The boxes are composed by the first quartile, the median and the third quartile. The whiskers give the lowest value larger than [first quartile – 1.5INTERQR] and the largest value lower than [third quartile + 1.5INTERQR], where INTERQR is the interquartile range (i.e. INTERQR = third quartile – first quartile). The crosses are observations outside the range of the whiskers. The dots (o) indicate the mean values of spectators for the (half-) seasons.

3. Model specification and empirical approach

In this section, we discuss the model and the empirical approach we implement in order to estimate the demand for Swiss football. As already mentioned, the existing empirical sports literature does not treat satisfactorily the ground-capacity constraint (see Dobson and Goddard, 2001). Indeed, only Czarnitzki and Stadtmann (2002) and Forrest et al. (2004) consider that the observed numbers of spectators are only a lower bound for the effective demand: when a stadium is full, it is not possible to know how many people wanted to attend the game. The variable recording attendance is then censored and the usual estimation techniques give biased coefficients. However, these two studies apparently do not take into account the panel dimension of the data. Forrest et al. (2004) also estimate a separate demand for Division 1 English Football by OLS, justifying its use because of the very low frequency of sell-out games. The same argument is used by Forrest and Simmons (2006) in their estimation of the attendance demand for English Football League. This argument is not totally convincing, since the results from OLS can be biased even if only a little proportion of observations is censored.

Obviously, censoring is not evenly distributed among clubs in Switzerland. Very few stadiums are regularly sold out, whereas generally attendance is far away from maximum stadium capacity (see Table 3 below). Eventually, Forrest et al. (2005) avoid the censoring problem by explaining the television audience instead of the gate attendance itself.[7] This solution is however not satisfactory in our case, since our aim is to explain what brings more people to come to watch live football at the stadium and to estimate e.g. how large is the price elasticity of attendance. We thus prefer to analyse straightly the gate attendances and thus modify the econometric model in order to obtain consistent estimators.

[7] Note however that broadcasting audiences are not measured with great precision but only on a survey basis.

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For every match day, t, we want to determine the impact of price, p_{it}, and other variables, X_{it}, on the ("true") number of spectators, $spect_{it}^*$ in the team-stadium i. The number of tickets each team can sold for a given match day is bounded by its stadium capacity and safety considerations. The Tobit model we want to estimate is:

$$\ln spect_{it}^* = \alpha \ln p_{it} + X_{it}\beta + \nu_i + \varepsilon_{it}, \quad (1)$$

where $\ln spect_{it}^*$ and $ln\ p_{it}$ are, respectively, the natural logarithm of the number of spectators attending the game and the natural logarithm of the ticket price for stadium i at time t; $\nu_i \sim N[0, \sigma_\nu^2]$ is the stadium individual random effect; and $\varepsilon_{it} \sim N[0, \sigma_\varepsilon^2]$ is an error term. We observe:

- $spect_{it} = spect_{it}^*$ *if* $spect_{it}^* < cap_i^{95}$; and
- $spect_{it} = cap_i^{95}$ *if* $spect_{it}^* \geq cap_i^{95}$,

where cap_i^{95} is the 95% of the official capacity of stadium i. As Forrest et al. (2004) observe, the censoring points should not be the official published stadium capacities, since these figures are not reliable, as evidenced by the fact that the maximal attendance is superior to the "official" maximal ground capacity in our dataset (32'728 < 33'433, see Table 2). Firstly, official capacities are not often up-to-date and secondly, they change from game to game, depending on the number of seats left empty for safety reasons. Like Forrest et al. (2004), we arbitrarily set the censoring point at 95% of the official ground capacity (cap_i^{95}). This gives us a total of 29 censored observations, corresponding to 7% of the valid sample (see Table 3).

Table 3 Number of censored observations by stadium

Stadium	Total	Censored 95%	Censored 100%
FCA	18	2	2
FCB	54	6	5
FCL	18	0	0
FCZ	54	0	0
GC	54	3	3
LS	11	0	0
LUZ	22	1	1
NX	47	0	0
SFC1	29	0	0
SFC2	24	0	0
SG	47	10	10
YB	50	7	4
Total	428	29	25

We need to maximise the likelihood function of our sample in order to retrieve estimates of α and β. The first part of the likelihood below (2) refers to the uncensored observations, i.e. the games that are played in stadium less than 95% full. For those games, the number of spectators records the true demand for the game. The contribution to likelihood of these observations is given by the (usual) distribution function. The second part of the likelihood below (2) concerns the censored observations, for which the number of spectators is more than 95% of the stadium capacity. The likelihood contribution for these observations is given by the survivor function, since all we know about sold out games is that the demand was at least the number of spectators attending.

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Because the number of spectators is a right-censored measure for the actual demand we have to use a nonlinear panel model. The estimation of such a model with fixed effects is known to suffer from the "incidental parameters" problem (Neyman & Scott, 1948; Lancaster, 2000). In order to take account for both panel and censoring characteristics at once and because of the inconsistency of the fixed effects estimator for nonlinear panel, we estimate a random effects Tobit model corresponding to the following log-likelihood function:

$$\ln L = \sum_{spect_{it} < cap_i^{95}} \left\{ \ln \int_{-\infty}^{\infty} \frac{\exp\left(-\nu_i^2 \Big/ 2\sigma_\nu^2 \right)}{\sqrt{2\pi}\sigma_\nu} \left\{ \prod_{t=1}^{T_i} \left(\sqrt{2\pi}\sigma_\varepsilon \right)^{-1} \exp\left(-\frac{\ln spect_{it} - \left(\ln p_{it}\alpha + X_{it}\beta + \nu_i \right)}{2\sigma_\varepsilon} \right) \right\} d\nu_i \right\}$$

$$+ \sum_{spect_{it} \geq cap_i^{95}} \left\{ \ln \int_{-\infty}^{\infty} \frac{\exp\left(-\nu_i^2 \Big/ 2\sigma_\nu^2 \right)}{\sqrt{2\pi}\sigma_\nu} \left\{ \prod_{t=1}^{T_i} \left(1 - \Phi\left(\frac{\ln cap_i^{95} - \left(\ln p_{it}\alpha + X_{it}\beta + \nu_i \right)}{\sigma_\varepsilon} \right) \right) \right\} d\nu_i \right\} \quad (2)$$

where σ_ν is the panel-level variance component and σ_ε is the overall variance component.

As mentioned in the previous section, the television variable cannot be used directly in the estimation, because of an obvious endogeneity problem. Indeed, both broadcasters and audience favour the same games (Forrest et al., 2005). It follows that games attended by many spectators are more often shown live in television. Broadcasters are in addition reluctant to display matches if there are sections with empty seats in the stadium. We choose therefore to instrumentalise the television variable using the fact that broadcasted games are usually differed in time so that they do not overlap with other matches. Almost 75% of the games shown on television started between 4 and 6 p.m. (see Table 4). As a consequence, a possible instrument for television is a binary variable taking the value one if the game begins between 4 and 6 p.m. and zero otherwise. The correlation matrix between the *Attendance*, the *Television* and the *Midafternoon* variables is such that our instrument is correlated with the *Television* variable, but totally uncorrelated with the attendances.[8]

Table 4 Schedule of broadcasted games

Schedule	Broadcasted		Total
	No	Yes	
Before 4 p.m.	41	7	48
Between 4 and 6 p.m.	102	64	166
Between 6 and 8 p.m.	193	3	196
After 8 p.m.	6	12	18
Total	342	86	428

Note: The upper bound of each interval is not included. For example, "between 4 and 6 p.m." more precisely means that the game begins in the interval [4:00; 6:00).

In the literature, we can also find discussions about the endogeneity of entrance fees. However, contrarily to Falter and Pérignon (2000), Falter et al. (2007) and Garcia and Rodriguez (2002), we do not have problems with the endogeneity of prices, as they do not change from game to game. In Switzerland, entrance fees are not increased when the visiting

[8] The polyserial correlation coefficient between the (logarithm of) *Attendance* and *Midafternoon* is 0.03, while the tetrachoric correlation coefficient between *Midafternoon* and *Television* is 0.60.

team is a prestigious one. Therefore, unlike Falter and Pérignon (2000) and Falter et al. (2007), we do not have to drop this variable, and unlike Garcia and Rodriguez (2002), we do not have to instrumentalise it.

The methodology we apply is thus a two-stage procedure. In the first step, we estimate a probit model explaining whether the game is broadcasted live or not. We then use the probabilities predicted by this model as a covariate in the censored panel model explaining the (natural logarithm of the) number of spectators, which constitutes the second step and the main estimation of our analysis.

4. Results and discussion

The initial sample was composed of 556 games (two seasons with 188 and one with 180 games). After removing observations for which price was missing, we were left with 429 fixtures. We also dropped one observation because it was an obvious outlier,[9] and we will thus fit our model to 428 games (155 in season 2001-02, 129 in 2002-03 and 144 in 2003-04), having been played by 11 home teams and in 12 stadiums.[10]

The first column of Table 5 shows estimates from the probit model explaining whether a game is televised or not. Even if it is not the primary goal of this paper, it is still interesting to look at the coefficients obtained here since they give an idea of the incentives of broadcasters in Switzerland when choosing games to be displayed.

The number of goals scored by the home team since the beginning of the season has a strong positive effect on the probability of being televised. Broadcasters are naturally interested in showing games with many goals. Similarly, games are more often broadcasted if the visiting team is the championship's leader, since it can be expected to be high quality play. The German part of Switzerland being the most populated, we observe that games between two Swiss German teams have a greater probability of being displayed. Those games will normally be followed by a larger audience. The age of the stadium (which can be considered inversely correlated with its quality) affects negatively the probability of broadcasting, and it therefore seems that broadcasters are reluctant to show games played in old stadiums. Finally, *Midafternoon* is highly significant, as we expected. It confirms that broadcasted games are those usually played between 4 and 6 p.m.

Columns 3 to 6 of Table 5 present the results of the different models we tested to explain attendances. Model I is a random effects Tobit model with censoring at 95% of stadium capacity; model II is estimated by Generalised Least Squares (GLS) random effects; model III is again a Tobit model, but with censoring at 100% of stadium capacity; and model IV is identical to model I, except for the variables included.

Looking at the results of the "base" model (I), we observe that almost every coefficient is strongly significant, with the expected sign. We note that the results from the GLS (model II) indicate a positive price elasticity and a "Super League effect" (see variable *New formula*) which is almost the double than the one estimated with model I. This simple comparison supports our previous discussion on the importance to account for stadiums' capacities and

[9] This observation corresponds to the match SFC-YB played on Sunday 16th March 2003, and which was the opening match of the new Geneva stadium. It attracted 29'000 spectators, many of whom were guests or people only interested in seeing the new stadium from inside. As a proof, the second highest attendance for this team is only 18'825 (see Figure 1), the 2nd game that took place in this stadium attracted 7'662 spectators and the next SFC-YB that took place on the Sunday 31st August 2003 was followed by 8'250 people only.

[10] The team SFC moved in a new stadium between the QR and FR of season 2002-03. This is the reason why we attach the fixed effects to stadiums instead of home teams. If the dataset contained no stadium change, home team effects and stadium effects would be identical.

censoring in the estimations. On this latter, note however that the choice of the censoring point (at 95% stadium capacity vs at 100% stadium capacity) does not imply significant differences, as can be observed by comparing the coefficients of models I and III. Model IV is very similar to model I, except that we introduced a few additional variables in order to account for the FC Basel special case. The resulting coefficients for the two models are very similar, with the noteworthy difference for the price-elasticity discussed below. In the following discussion, we thus confine our analysis to the results obtained with models I and IV.

Given the functional form of the estimated equation (2), the coefficients of the continuous variables (except for prices) can be easily interpreted as semi-elasticities, i.e. the percentage change in the number of spectators for a given unit change in the independent variables, all other characteristics remaining the same. For dummy variables, however, the coefficients are not directly interpretable. Indeed, as shown by Halvorsen and Palmquist (1980) those coefficients must be transformed using the formula $(e^{\beta} - 1)$ to obtain the percent change in the dependent variable.

We observe that broadcasting has a negative but non statistically significant impact on attendance, a result also obtained by Forrest et al. (2004).

Since the price variable is expressed in log, the associated coefficient can directly be interpreted as an elasticity. Therefore, our estimation reveals a weak mean price-elasticity of –0.53 (see the associated coefficient in model I). A weak price-elasticity of demand implies that increasing price would lead to an increase in the gate revenues. It moreover indicates that football teams do not seem to behave like profit-maximizing monopolies, since in that case they would raise their prices to be in the range where the demand is price-elastic.[11] However, as we mentioned before, the FC Basel enjoyed a particular "status" in the Swiss football panorama during the period under study, both in terms of gate attendances and of sport achievements. We thus estimate a model (IV) including a dummy variable to distinguish the FC Basel (*FCB*) from the other teams included in the sample, and a variable crossing that dummy with the log of prices, $FCB \times \ln Price$. As expected, the parameter related to the dummy *FCB* is highly significant. Moreover, the new coefficients for the prices imply a price elasticity of –1.03[12] for the FC Basel against the –0.32 (in average) estimated for the other teams. Thus, our estimates clearly suggest that during the period under review the FC Basel has indeed exploited his market power at least in what concerns the price level at gate attendance.

Ice hockey is the second most popular sport in Switzerland, and we could expect some substitution effect with football. The coefficient estimated for the dummy variable indicating whether a hockey team of the same canton plays in the highest division of the Swiss championship is effectively negative, but however not significant. This could indicate that people following football are not the same as those following hockey, but we concede that our variable for ice hockey is quite imprecise and could be refined. For instance, we could have defined a dummy variable indicating if the football game is played on the same day (or even the same time) as a hockey game in the same region. The number of such overlapping games in our database is however too small to estimate a robust coefficient for such a variable.

[11] Forrest, Simmons and Feehan (2002) discuss this issue in some details.

[12] Using the variance-covariance matrix of estimators, we calculated the standard error of the estimated price-elasticity for the FC Basel and obtained a value of 0.340, suggesting a significance level close to 0.01.

Table 5 Results

Variable	dep. var = tv	dep. var = log number of spectors			
		(I)	(II)	(III)	(IV)
Tv prob	–	– 0.104	0.125	– 0.102	– 0.126
		(0.105)	(0.158)	(0.105)	(0.106)
ln *Price (seated)*	– 0.096	– 0.529 ***	0.238 ***	– 0.519 ***	– 0.319 *
	(0.299)	(0.170)	(0.080)	(0.170)	(0.186)
Hockey	0.032	– 0.052	– 0.097 *	– 0.059	0.018
	(0.231)	(0.069)	(0.052)	(0.070)	(0.078)
Kuypersh (x100)	– 0.083	– 0.068 ***	– 0.084 ***	– 0.069 ***	– 0.070 ***
	(0.085)	(0.013)	(0.020)	(0.013)	(0.013)
Uncertainty	– 0.262	– 0.181 ***	– 0.199 ***	– 0.180 ***	– 0.178 ***
	(0.201)	(0.029)	(0.045)	(0.029)	(0.029)
GoalHF	0.027 ***	0.007 ***	0.015 ***	0.007 ***	0.008 ***
	(0.008)	(0.002)	(0.002)	(0.002)	(0.002)
GoalHA	– 0.007	– 0.010 ***	– 0.019 ***	– 0.010 ***	– 0.011 ***
	(0.010)	(0.002)	(0.002)	(0.002)	(0.002)
Derby	0.240	0.353 ***	0.361 ***	0.352 ***	0.353 ***
	(0.385)	(0.069)	(0.106)	(0.070)	(0.069)
Dumleader	0.585 **	0.407 ***	0.249 ***	0.397 ***	0.415 ***
	(0.276)	(0.053)	(0.078)	(0.053)	(0.053)
German	0.463 *	0.164 ***	0.311 ***	0.163 ***	0.172 ***
	(0.248)	(0.045)	(0.063)	(0.045)	(0.045)
French	– 0.007	– 0.011	– 0.040	– 0.012	– 0.012
	(0.542)	(0.070)	(0.106)	(0.071)	(0.070)
Distance (100km)	– 0.072	– 0.063 *	0.007	– 0.065 **	– 0.063 *
	(0.201)	(0.033)	(0.046)	(0.033)	(0.033)
Sunday	0.159	0.174 ***	0.144 ***	0.179 ***	0.179 ***
	(0.205)	(0.035)	(0.055)	(0.035)	(0.035)
Sun	0.002	0.001 **	0.000	0.001 **	0.001 **
	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)
Age (x10)	– 0.068 **	– 0.087 **	– 0.085 ***	– 0.086 **	– 0.033
	(0.034)	(0.044)	(0.008)	(0.043)	(0.036)
Unemp rate	– 0.082	0.042	– 0.043 *	0.045	0.028
	(0.095)	(0.031)	(0.023)	(0.031)	(0.030)
New formula	– 0.186	0.152 ***	0.354 ***	0.150 ***	0.161 ***
	(0.300)	(0.055)	(0.071)	(0.055)	(0.055)
FCB	–	–	–	–	3.449 ***
					(1.278)
FCB×ln Price	–	–	–	–	– 0.712 *
					(0.378)
Midafternoon	1.234 ***	–	–	–	–
	(0.205)				
Constant	– 1.147	11.084 ***	8.868 ***	11.046 ***	10.001 ***
	(1.214)	(0.581)	(0.317)	(0.581)	(0.616)
Observations	428	428	428	428	428
uncensored	–	399	–	403	399
censored	–	29	–	25	29
Log Likelihood	– 147.863	– 94.421	–	– 95.324	– 90.384

Notes: Standard errors in parentheses. */**/*** indicates a coefficient significant at the 0.1/0.05/0.01 level. Models: (I) and (IV): Tobit with censoring at 95% of stadium capacity; (II): GLS random effects; (III): Tobit with censoring at 100% of stadium capacity. The results of the auxiliary equation of model (IV) are not displayed.

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The uncertainty measures (*Kuypersh* and *Uncertainty*) both have the expected negative sign and are highly significant. This proves once again that spectators are more interested when the outcome of the game is uncertain, but also when the outcome of the championship is undecided. Likewise, attendances are greater when the home team scored a lot in the previous games and when it received few goals. In other words, more fans come to watch their favourite team when it is strong.

As we expected, derbies attract larger crowds to stadiums. Those games have an additional stake because they oppose two neighbours. More people come as well when the visiting team is the actual leader of the championship, since this could be interpreted as a guarantee to watch a good game.

Concerning the different linguistic parts of the country, we find that a game between two Swiss German opponents increases attendance whereas a game between two Swiss French teams does not. This could be the sign for a different attitude between the linguistic regions toward football. However, it should be noted that only very few games opposed two Swiss French teams during our observation period, which could explain the non-significance of this variable.

Concerning the opportunity cost variables, our results corroborate those of Garcia and Rodriguez (2002). As the distance between the two competing clubs increases, the number of spectators diminishes. The variation is probably attributable to supporters of the away team. If the distance they have to travel is too long, they will not come to watch the game because distance increases the opportunity cost to attend a football game. Games played on a Sunday attract greater attendances. Indeed, people have more time and their opportunity cost is therefore lower on the last day of the week. It is also an occasion to go out for some families. Finally, our results show that attendances are larger when the weather is sunny.[13]

More people attend games played in recently built stadiums. This result could be due to the fact that more recently built stadiums probably possess a better quality and are safer, which thus increases attractiveness and probably also has an impact on the spectators composition (e.g. families and women). However, in model IV, this effect is still positive but no longer statistically significant once the dummy variable *FCB* is included. As expected, the local unemployment rate has a positive impact on attendance, but negligible in terms of statistical significance.

Finally, we find that the new championship formula per se increased the average attendance by about 16%, which is a relatively large impact. It therefore seems that the revision of the Swiss championship that took place in 2003 was very welcomed by the spectators.

5. Conclusion

In this paper, we have estimated a demand function for the Swiss football championship, using data from three seasons of the top tier Swiss football, 2001-02, 2002-03 and 2003-04. We were very careful about the econometric difficulties imposed by our dataset. We took into account capacity constraints without neglecting the panel dimension of the data.

Since broadcasting is highly correlated with attendances, we used a two-stage procedure in order to remove endogeneity. In the first step, we ran a probit model explaining the

[13] Fitting the same model with a quadratic functional form shown that attendance is an inverted U-shape function of the minutes of sun per hour. Our interpretation of this result is that people do not come to stadium if the weather is very bad, but if it is really sunny, they prefer to do something else. The maximal attendances are therefore observed when the sun shines a little bit more than 35 minutes per hour.

probability of live broadcasting a game. In the second step, we used the live broadcasting probabilities predicted by the first-stage estimation as a covariate in a random effects Tobit model explaining attendances to football games.

Our results show the importance to take explicitly into account the censoring problem due to stadiums' capacity. We highlight that television has only a negligible effect on the number of spectators travelling to stadium. However, since in more recent seasons the advent of pay-TVs increased, it will be interesting in future work to test again the influence of TV on attendance. Price-elasticity seems to be well under unity, implying that most football teams of the Swiss championship do not behave like profit-maximizing monopolies. This implies in particular that, at the levels of price during the 2001-2004 seasons, football clubs could have raised their gate revenues by increasing entrance prices. However, we found that the FC Basel was a special case during the period we analyse, given that its price-elasticity was not statistically different from –1, so that it probably exploited some of its market power in order to charge higher entrance fees. Uncertainty at the individual match level and at the season level has been taken into account. As expected, both types of uncertainty increase attendances. People are logically more interested by games where the play is expected to be high level. As such, attendances are larger when the home team scored a lot in the previous games, when the visiting team leads the championship and when the match is a derby.

An interesting feature of our paper is the possibility to test for the impact on attendance due to a major revision of the championship rules in the period under observation. Our results show that the new championship formula improved attendances by about 16%. In order to confirm the persistence of this last result, a similar analysis should however be repeated over a longer period, since our analysis covers three seasons only, two with the old formula and one with the new.

References

Borland, J. & R. Macdonald (2003), 'Demand for Sport', *Oxford Review of Economic Policy* **19**(4), 478–502.

Czarnitzki, D. & G. Stadtmann (2002), 'Uncertainty of Outcome Versus Reputation: Empirical Evidence for the First German Football Division', *Empirical Economics* **27**(1), 101–112.

Dobson, S. & J. Goddard (2001), The Economics of Football, Cambridge: Cambridge University Press.

Falter, J.-M. & C. Pérignon (2000), 'Demand for Football and Intramatch Winning Probability: An Essay on the Glorious Uncertainty of Sports', *Applied Economics* **32**(13), 1757–1765.

Falter, J.-M., C. Pérignon & O. Vercruysse (2007), 'Impact of Overwhelming Joy on Consumer Demand: The Case of a Soccer World Cup Victory', *Journal of Sports Economics* **8**(5), forthcoming.

Flückiger, Y. & A. Manzini (1991), 'Analyse Économique de la Demande pour les Spectacles Sportifs: Le Cas du Football Suisse', in *Sports et Âges de la Vie Adulte* 1, Études et Recherches du GISS, 159–168.

Forrest, D. & R. Simmons (2006), 'New Issues in Attendance Demand: The Case of the English Football League', *Journal of Sports Economics* **7**(3), 247–266.

Forrest, D., R. Simmons & B. Buraimo (2005), 'Outcome Uncertainty and the Couch Potato Audience', *Scottish Journal of Political Economy* **52**(4), 641–661.

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Forrest, D., R. Simmons & P. Feehan (2002), 'A Spatial Cross-Sectional Analysis of the Elasticity of Demand for Soccer', *Scottish Journal of Political Economy* **49**(3), 336–355.

Forrest, D., R. Simmons & S. Szymanski (2004), 'Broadcasting, Attendance and the Inefficiency of Cartel', *Review of Industrial Organization* **24**(3), 243–265.

Garcia, J. & P. Rodriguez (2002), 'The Determinants of Football Match Attendance Revisited: Empirical Evidence from the Spanish Football League', *Journal of Sports Economics* **3**(1), 18–38.

Greene, W. (2004), 'The Behaviour of the Maximum Likelihood Estimator of Limited Dependent Variable Models in the Presence of Fixed Effects', *The Econometrics Journal* **7**(1). 98–119.

Halvorsen, R. & Palmquist, R (1980), 'The Interpretation of Dummy Variables in Semilogarithmic Equations', *American Economic Review* **70**(3), 474–475.

Kuypers, T. (1996), 'The Beautiful Game? An Econometric Study of Why People Watch English Football', *Discussion Paper in Economics* 96-01, University College London.

Lancaster, T. (2000), 'The Incidental Parameter Problem Since 1948', *Journal of Econometrics* **95**(2), 391–413.

Neyman, J. & E. Scott (1948), 'Consistent Estimates Based on Partially Consistent Observations'. *Econometrica* **16**(1), 1–32.

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APPENDIX

Table 6 Data sources

Variable	Source
Attendance	www2.top11.ch (former official web site of the Swiss Football League)
Ticket price	Swiss consumer price index (SFSO)
Schedule and results	www.football.ch (web site of the Swiss Football Association)
Weather conditions	Federal Office of Meteorology and Climatology MeteoSwiss
Television	Marketing committee of the Swiss Football League

Table 7 Soccer teams in Switzerland

Identifier	Complete name	Canton	Linguistic region
FCA	Football Club Aarau	Argovia	German
FCB	Football Club Basel 1893	Basle-City	German
FCL	Football Club Lugano	Ticino	Italian
FCZ	Football Club Zürich	Zurich	German
GC	Grasshopper-Club Zürich	Zurich	German
LS	Lausanne Sports	Vaud	French
LUZ	Football Club Luzern	Luzern	German
NX	Football Club Neuchâtel Xamax	Neuchâtel	French
SFC	Servette Football Club	Geneva	French
SG	Football Club Sankt Gallen	St.Gall	German
SION	Football Club Sion	Valais	French
SRD	Sports-Réunis Delémont	Jura	French
TH	Football Club Thun	Bern	German
WIL	Football Club Wil 1900	St.Gall	German
YB	BSC Young Boys	Bern	German

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