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How Season Ticket Holders' Time of Stadium Entrance Is Influenced by Outcome Uncertainty

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Abstract: *This paper constitutes a unique micro-level exploration of the relation between game outcome uncertainty and the behavior of highly committed season ticket holders of a major Bundesliga soccer team. Specifically, we look at 3,113 season ticket holders attending all 17 home games in the 2012–13 season and explore whether outcome uncertainty had an impact on their stadium arrival time. We find strong evidence that increased uncertainty about the expected outcome prompts these spectators to enter the stadium earlier. Moreover, season ticket holders travelling from outside the hosting city or paying higher season ticket prices exhibit a stronger reaction to uncertainty compared with season ticket holders in the standing section. We also find that younger spectators are less likely to arrive late when uncertainty increases.*

Keywords: outcome uncertainty, soccer, football, consumer demand, attendance, season ticket holders.

JEL code: L83, D12, R22, Z19

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1. Introduction

Spectators generate an atmosphere in the stadium long before the game actually starts. For example, when players step onto the turf to warm up, they might immediately become agitated or intimidated by the crowd size, which, because of its influence, is often termed the 12th man. During warm-up, the players also have enough time to hear the (often loud) sounds, chants, vocal encouragement and enthusiasm of the crowd, thereby gauging the stadium atmosphere. Understanding the demand for football attendance, therefore, has a relatively long tradition in the academic literature, one that dates back to the 1970s (see, e.g., Hart et al., 1975).

Dobson and Goddard (2001) classify the resulting literature into two streams, one that models game attendance and a second that models entire season or annual attendance. They also differentiate two types of spectators based on potentially dissimilar incentives for attendance: (i) season ticket holders who have made a pre-commitment to be a regular part of the home games and (ii) purchasers of tickets for individual games (Dobson and Goddard 2001). The research so far, however, has relied primarily on easily accessible *aggregated* game attendance across both spectator types, which has led to arbitrary measures of important factors such as demographic and geographic determinants (Dobson and Goddard, 2001). The common use of aggregated game attendance data has also prevented the exploration of additional attendance dimensions such as the time at which spectators actually enter the stadium and what drives them to come earlier.

In this study we are therefore looking at the behavior of *individual* season ticket holders. Specifically, using microdata from a German professional soccer club, we measure the point in time when spectators enter the stadium. In particular, we are capturing the existence or absence of an “uncertainty of outcome effect” and investigate whether any uncertainty effect is related to individual season ticket holder characteristics. In doing so, we contribute to the growing literature on how soccer attendance is shaped by outcome uncertainty[1] while at the same time providing a new analytic angle to a common phenomenon.

It is especially worth noting that the arrival time at a sporting venue is not only relevant to stadium atmosphere but also to conditions in the wider environment. Clubs from the German *Bundesliga*, for instance, sell over 13.5 million tickets per season (DFL, 2013). As a result the coordination of traffic, the provision of public transportation and security services at games requires extensive planning. In this particular context, a better understanding of factors affecting spectators' arrival time could not only help the clubs to coordinate their marketing and sales efforts prior to the game but also enable them to better predict and manage potential crowd flow inside and outside the stadium.

2. Data and empirical framework

The data set used in this paper contains detailed information on 3,113 season ticket holders (STHs) of a German professional soccer club in the *Bundesliga*[2] across the entire 2012–13 season; that is, 17 consecutive home games. In order to hold the level of (high) commitment constant while exploring how game uncertainty affects arrival at the stadium, we focus only on season ticket holders that attended all 17 games. Nonetheless, in our empirical analysis, we drop the last game of the season because spectators were aware before the game that this match had no implications for their home team's ranking. In addition, this game is a clear outlier in our data set, having the lowest outcome uncertainty and earliest season ticket holder arrival time across all games (see Notes in *Figure 1*).

Information on both individual attendance and arrival time was gathered with the help of the club's stadium access system and was provided by the club after the season. In

[1] For an overview, see, e.g., Szymanski (2003) or Fort (2006) and Dobson and Goddard (2001).
[2] Founded in 1962 in Dortmund, the *Fußball-Bundesliga* or *Bundesliga* is Germany's primary soccer competition. Running from August to May, it is contested by 18 clubs and operates on a system of promotion and relegation with the *2. Bundesliga*, Germany's second division.

addition, we were able to employ information on socio-demographics for each season ticket holder, as well as information on seating modalities and, where applicable, the termination date.

We evaluate the influence of uncertain outcomes on arrival time using a random-effects model. Our baseline specification has the following structure:[3]

$$TIME_{it} = \beta_1\, THEIL_t + \beta_2\, AGE_{it} + \beta_3\, MALE_i + \beta_4\, EXTERNAL_i + \beta_5\, TICKETS_i + \beta_6\, STAND_i + \beta_7\, ROW_i + \beta_8\, COST_i + \beta_9\, CHURN_{it} + (u_i + \varepsilon_{it}), \qquad (1)$$

where arrival time (TIME) is measured in minutes prior to kick-off and denotes the exact moment at which a season ticket holder (STH) enters the stadium. The variable has a positive sign when the game has not yet started and a negative sign after kick-off (i.e., the ticket-holder is late). We also conduct robustness tests using an alternative dependent variable: whether a STH was LATE or not (1 = late, 0 = otherwise). We control for each STH's sociodemographics by including age (AGE),[4] geographic location (whether they live outside the city (EXTERNAL)), and a dummy variable for gender (MALE). We also consider the number of total season tickets a STH bought prior to the season (TICKETS) as an approximation for consumption in a group (e.g., a family in which the father bought a season ticket not only for himself but also for his son).[5] To control for differences in seating modalities, we include dummy variables for standing section (STAND), the cost of the season ticket (COST), and the distance to the playing field (ROW). To assess whether enthusiasm for the team declines after termination of a season ticket, we also include a dummy that measures whether the STH has already resigned or not (CHURN, 1 = resigned, 0

[3] *Table A1* reports the descriptive statistics.
[4] Relatively precise estimates taking into account the exact day (date of the game – date of the birthday)/365
[5] Although *Table A1* shows that the STHs in our sample hold up to five season tickets, because individual information is available only for the season ticket holder, we include only one registered season ticket per patron.

= not). Our key variable, outcome uncertainty, is proxied by a measure suggested by Theil (1967): THEIL $= \sum_{i=1}^{3} p_i \log\left(\frac{1}{p_i}\right)$. The widely used THEIL measure incorporates the probabilities for the three possible game outcomes based on betting odds.[6] Because small differences between these three probabilities result in a large THEIL, an increase in THEIL is associated with an increase in outcome uncertainty (values between 0 and 1). In some specifications, we also control for the STH's stadium location using BLOCK dummy variables that represent the 38 divisions (blocks) between which the atmosphere may differ. In addition, we use extended specifications to explore interaction effects between THEIL and individual characteristics.

3. Results

Figure 1 shows the correlation between outcome uncertainty, THEIL, and the average number of minutes before kick-off that STHs arrive at the stadium. The results for each of the 16 games analyzed indicate a strong positive correlation between both variables (Pearson r=0.604) significant at the 0.05 level, which indicates that an increase in expected outcome uncertainty prompts spectators to come to the stadium earlier. Indeed, a simple linear regression suggests that one-unit increase in THEIL (from 0 (complete certainty) to 1 (complete uncertainty)) increases the STHs' pre-game early arrival by 44 minutes. The THEIL variable also explains over 36 percent of the total variance in pre-kick-off arrival time, which is a difference of 4 minutes if we move from the lowest THEIL in our data set (0.3818) to the highest (0.4727). Over 3,000 spectators arriving an average of four minutes earlier can simultaneously present both an opportunity and challenge for the operating sporting club.

[6] The THEIL measure is used regularly as a proxy for outcome uncertainty (e.g., Benz et al., 2009; Pawlowski and Anders, 2012) based on a number of different bookmakers. In this paper, we use odds from *bwin*, the world's largest publicly traded online gambling firm. The data were derived from football-data.co.uk.

In *Table 1*, we present the panel regression results using a random effects model. Standard errors are estimated with a cluster-robust covariance estimator that treats each individual as a cluster. To explore the robustness of our key variable THEIL, we run three different estimations with the number of independent variables increased each time (see specifications 1 to 3). The first (1) includes THEIL as a single factor; the second (2) extends the specification with demographic characteristics (age and gender) and the STH's home location (outside the city); and the third adds in the STH's stadium seating modalities. Not only is the THEIL coefficient always statistically significant at the 0.1% level, but overall (and consistent with the descriptive results above) the coefficients indicate that an increase on the THEIL scale from 0 to 1 increases pre-kick-off arrival time by around 44 minutes. Therefore, an increase in outcome uncertainty does have an impact on the time at which STHs enter the stadium, a finding that is in line with the underlying assumption of the classic uncertainty of outcome hypothesis (i.e., that spectators care about outcome uncertainty; see Rottenberg, 1956, and later Neale, 1964).

Next, in two further specifications, (4) and (5), we explore the interaction effects with and without BLOCK fixed effects (4 and 5, respectively). Interestingly, uncertain outcomes seem to play an important role in increasing arrival time for three groups: STHs that have paid a higher price for their season ticket, those living outside the stadium city, and those in the standing section. For example, specification (4) indicates that if uncertainty increases by one unit, those coming from outside the city arrive 30 minutes earlier than the locals. Controlling for stadium divisions/BLOCKS barely changes this outcome.

Finally, we explore the determinants of late arrival by changing the dependent variable in specifications (6) and (7). The results remain robust: an increase in THEIL from 0 to 1 reduces the probability of late arrival by 0.17 (specification 6). In specification (7), however, we observe an interaction effect for AGE and also for EXTERNAL. Thus, spectators from outside the city and younger spectators are less likely to arrive late if uncertainty increases.

4. Conclusions

Using a unique panel data set with information on 3,113 highly committed season ticket holders, our results support the assumption that spectators in general, and STHs in particular, react to outcome uncertainty. More specifically, when perceiving an increase in outcome uncertainty, STHs change their behavioral patterns and arrive at the stadium earlier. Such an effect is even stronger for those coming from farther away (outside the city), those who have paid a higher season ticket price, and those in the standing section.

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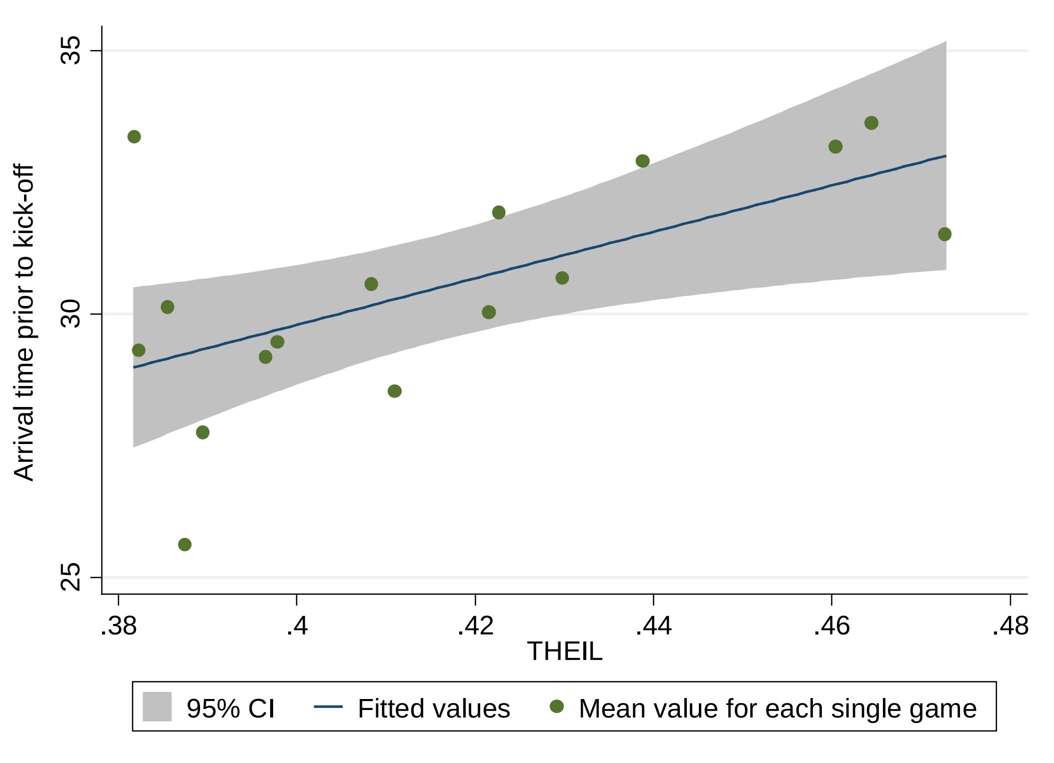
Tables and Figures

Figure 1: Correlation between arrival time prior to kick-off and outcome uncertainty



Notes: Fitted for game days 1–16; game day 17 can be seen as an outlier (lowest uncertainty, THEIL = 0.34; earliest arrival time = 37.42).

Table 1: Factors that shape stadium arrival time and being late

Dep. variables	Arrival time					Late arrival	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
THEIL	44.1072***	44.0491***	43.8911***	15.0173	15.0124	-0.1740***	-0.2510*
	2.2476	**2.2480**	**2.2539**	**12.9284**	**12.9328**	**0.0194**	**0.1180**
	19.62	*19.59*	*19.47*	*1.16*	*1.16*	*-8.95*	*-2.13*
AGE		-0.0300	0.0153	0.0067	0.0068	-0.0002***	-0.0012*
		0.0166	**0.0186**	**0.0597**	**0.0597**	**0.0000**	**0.0005**
		-1.81	*0.82*	*0.11*	*0.12*	*-4.48*	*-2.42*
MALE		-2.3866**	-2.7001***	-0.8908	-0.8803	0.0032	0.0189
		0.7551	**0.7522**	**2.3799**	**2.3728**	**0.0025**	**0.0194**
		-3.16	*-3.59*	*-0.37*	*-0.37*	*1.28*	*0.98*
EXTERNAL		7.7153***	7.9215***	-4.6321*	-5.0025*	-0.0055**	0.0341
		0.5901	**0.5959**	**1.9317**	**1.9290**	**0.0020**	**0.0175**
		13.07	*13.29*	*-2.40*	*-2.59*	*-2.67*	*1.95*
TICKETS			0.0026	2.1551	2.1916	0.0025	-0.0167
			1.1042	**3.1735**	**3.1837**	**0.0039**	**0.0387**
			0.00	*0.68*	*0.69*	*0.64*	*-0.43*
STAND			5.9602***	-2.8819	-5.2517	0.0000	0.0202
			1.1836	**3.7042**	**4.3052**	**0.0043**	**0.0329**
			5.04	*-0.78*	*-1.22*	*0.02*	*0.61*
ROW			-0.0784*	-0.0388	-0.0688	-0.0000	-0.0012
			0.0325	**0.1167**	**0.1200**	**0.0001**	**0.0009**
			-2.41	*-0.33*	*-0.57*	*-0.63*	*-1.26*
COST			-0.1018	-0.6208**	-0.7457***	-0.0000	0.0013
			0.0578	**0.1895**	**0.1982**	**0.0001**	**0.0017**
			-1.76	*-3.27*	*-3.76*	*-0.41*	*0.77*
CHURN			-1.3036	-19.7362	-19.5177	0.0085	-0.2528
			0.9801	**20.4863**	**20.4895**	**0.0079**	**0.2556**
			-1.33	*-0.96*	*-0.95*	*1.08*	*-0.99*
THEIL*AGE				0.0207	0.0207		0.0024*
				0.1403	**0.1403**		**0.0012**
				0.15	*0.15*		*2.04*
THEIL*MALE				-4.3570	-4.3527		-0.0386
				5.6690	**5.6710**		**0.0443**
				-0.77	*-0.77*		*-0.87*
THEIL*EXTERNAL				30.2018***	30.2013***		-0.0922*
				4.5680	**4.5696**		**0.0405**
				6.61	*-6.61*		*-2.28*
THEIL*TICKETS				-5.1802	-5.1705		0.0463
				7.9585	**7.9612**		**0.0877**
				-0.65	*-0.65*		*0.53*
THEIL*STAND				21.2741*	21.2693*		-0.0232
				8.8364	**8.8394**		**0.0713**
				2.41	*2.41*		*-0.33*
THEIL*ROW				-0.0954	-0.0957		0.0031
				0.2784	**0.2785**		**0.0022**
				-0.34	*-0.34*		*1.44*
THEIL*COST				1.2482**	1.2484**		-0.0027
				0.4485	**0.4486**		**0.0039**
				2.78	*2.78*		*-0.69*
THEIL*CHURN				46.6341	46.1711		0.6598
				52.1288	**52.1355**		**0.6452**
				0.89	*0.89*		*1.02*
BLOCK	NO	NO	NO	NO	YES	NO	YES
Groups	3,113	3,113	3,113	3,113	3,113	3,113	3,113
Observations	49,808	49.808	49,808	49,808	49,808	49,808	49,808
Wald chi2	385.09	545.73	584.16	631.65	717.69	106.44	299.91
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R^2	0.0036	0.0380	0.0472	0.0477	0.0651	0.0028	0.0066

Notes: Robust standard errors are in bold, *z*-values in italics. *, ** and *** represent statistical significance at the 5% ($p < .05$), 1% ($p < .01$) and .01% ($p < .001$) levels, respectively.

Appendix

Table A1: Descriptive statistics of key variables

Variables	**M**	**SD**	**Min**	**Max**
TIME	30.4833	21.4999	-92	123
LATE	0.0202	0.1409	0	1
THEIL	0.4156	0.0294	0.3818	0.4727
AGE	42.6005	17.8113	7.0255	86.2275
MALE	0.8040	0.3969	0	1
EXTERNAL	0.4914	0.4999	0	1
TICKETS	1.0597	0.2781	1	5
STAND	0.1088	0.3115	0	1
ROW	14.1843	9.3123	1	35
COST	16.8517	6.1798	5.5882	31.7647
CHURN	0.0084	0.0916	0	1

Notes: N = 3,113 season ticket holders; 49,808 observations.