

The Novelty Effect of New Soccer Stadia: The Case of Germany*

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ABSTRACT

When decisions are made to construct new stadia or to undertake major renovation work, the decision makers often assume that more spectators will be attracted. This so-called “novelty effect” is used as an argument that an impulse towards increased demand for the region and its services will be created, thus justifying public sector management to supply public funding. This study registers the novelty effect of soccer stadia in Germany since the beginning of the Bundesliga (1963/64) up to the end of the 2003/04 season and is based on annual team attendance per game. The data from all 12,488 completed games was used to create the annual attendance per game for each team. A persistent novelty effect of around 2,700 spectators per match (10.7% increase) can be seen. This value is significantly below the values calculated for the US-American professional leagues. The extent to which public funding for soccer stadium buildings can be justified will be small indeed.

Keywords: sports venues, attendance estimation, novelty effect, public funding

1. INTRODUCTION

When decisions are made to construct new stadia or to undertake major renovation work, both the clubs and the political decision makers often assume that new buildings will attract more spectators, via the so-called “novelty effect”. The reason for this kind of increase in spectator numbers could be that a visit to a new, “modern” stadium provides an increased benefit to the spectators, for example due to greater comfort, better viewing conditions, or because of the increased “event” character of the games in the new stadium.¹ The potential increase in spectator figures lead to two separate conclusions, each of which has different emphases. On the one hand there is the argument that a considerable part of the investment costs can be covered by the additional incomes from ticket sales.² On the other hand there is also an argument that the additional spectators represent an impulse towards increased long-term demand for the region and its services, thus justifying public sector management to supply public funding.³

The following work takes up this line of argumentation from its inception and examines whether and to what extent newly built stadia actually lead to increased numbers of spectators. The work is organised as follows. Section II provides an overview of the relevant

(empirical) literature. Section III considers the theoretical development of the novelty effect over time. Section IV is concerned with a number of descriptive analyses of the novelty effect, whilst in Section V an econometric analysis is carried out. Section VI closes with a conclusion.

2. BACKGROUND AND PREVIOUS WORK

The novelty effect of stadia and arenas has hitherto been examined by means of various different approaches. Thus we find a number of difference-in-means approaches in the form of before-and-after comparisons of spectator figures, for example in the works of QUIRK and FORT (1992), HAMILTON and KAHN (1997) or HOWARD and CROMPTON (2003). Whilst this approach can be used to demonstrate the effects of new stadia on spectator numbers, there is however no control for other potential influencing factors.

Alternatively, econometric procedures are used, whereby a differentiation is made between two fundamental approaches. In the first approach assumptions with regard to the time duration and characteristics of the novelty effect are given exogenously with the aid of dummies (e.g. COATES and HUMPHREYS, 1999, 2005; DEPKEN, undated a; POITRAS and HADLEY, 2003; KAHANE and SHMANSKE, 1997). NOLL (1974) and COFFIN (1996) chose the construction of a variable that decreases as the age of the stadium increases and which adopts a zero value at a point in time defined by the author. BRUGGINK and EATON (1996) use the age of the stadium as an explanatory variable. This approach leads to an endogenous determination of the duration and intensity of the novelty effect and enables a separate dummy to be constructed for every year following the opening of the new stadium (COATES and HUMPHREYS, 2005; DEPKEN, undated b). This makes it easier to register the amortisation of the novelty effect, i.e. a reduction in the number of additional spectators over time. However, the loss of degrees of freedom due to the large number of dummies does represent a disadvantage.

So far, studies have concentrated on the major North American professional sports leagues, i.e. Major League Baseball (MLB), the National Football League (NFL), the National Basketball Association (NBA) and the National Hockey League (NHL). Even if major sports stadia have been built since the beginning of the 20th century, the novelty effect has only become the subject of intensive study since the 1970s. The authors are not

aware of any other studies on the novelty effect of stadia related to other types of sports than the North American sports mentioned above.

3. THE NOVELTY EFFECT IN THEORY

In view of the partly implicit assumptions in the above mentioned works, the theoretically conceivable developmental course of novelty effects can be grouped into three different variants:

- (a) Spectators quickly become accustomed to a newly built or renovated stadium, which thus demonstrates only a very short-term significant novelty value that only occurs during the first season directly after opening.
- (b) The novelty effect lasts for a longer period (e.g. five seasons) and subsequently ends abruptly.
- (c) The novelty effect begins on the date of the opening of the new stadium, assumes its highest value during the first season and falls continually and significantly over the following years. After a certain time a significant novelty effect can no longer be measured.

The following illustrations depict the various forms of the development of the novelty effect over time. When the novelty effect is represented using a dummy variable, this adopts the value of one in the first season following the opening of the new or newly renovated stadium in each of the three cases. Depending on the further development of the dummy over time, the variable adopts the value of zero in subsequent seasons in which a novelty value is no longer assumed.

However, newly constructed or renovated stadia can also have negative effects on spectator numbers. In addition to problems of capacity and possible inconveniences during the construction works it is also conceivable that the prospect of a new stadium may lead potential spectators to temporarily postpone proposed consumption to the post-opening period.⁴ For this reason the corresponding dummy variable, which has the value of one in the season prior to the opening and the value of zero otherwise, shall also be taken into consideration below.

4. DESCRIPTIVE ANALYSIS

Apart from a few exceptions (e.g. Bochum 1979, Leverkusen 1990, Nuremberg 1991, Stuttgart 1993), stadium construction activities for soccer clubs in Germany's Bundesliga can fundamentally be divided into the periods leading up to the two World Cup Championships that have taken place in Germany. The projects relating to the 2006 World Cup include all projects since 1998 (Dortmund, Gelsenkirchen, Hamburg, Rostock, Wolfsburg). In relation to the 1974 World Cup there were a total of ten (major) stadium construction and renovation projects.⁵

Table 1 shows the average spectator figures per game for the seasons 1967/68 to 1978/79 for the stadia newly constructed in connection with the 1974 World Cup. In the context of this study the variable "average spectators per game" is preferred to the variable "absolute spectator figures for the entire season": The Bundesliga, which as a rule has 34 match days, had only 30 match days at the first two seasons 1963/64 and 1964/65 and had 38 match days that the season 1991/92 due to German reunification. The first season held in a new stadium is emphasised via bold type and a border. Furthermore the tables also show the percentage change in spectator numbers in relation to the year before the opening of the new stadium. The points in time represent the five seasons following the opening of the stadium and are chosen analogously to the five year period of the mean analysis. The partially incomplete time series is a result of relegations from the "Bundesliga" (first division) to the "2. Bundesliga" (second division).⁶

– Table 1 –

For instance, in 1973/74 (t-1), Berlin drew 27,588 fans per game, but in 1974/75 (t), the season of the stadium opening, it drew 36,235 fans per game a 31% gain. The following season it drew 22,147 fans per game a loss 20% in comparison to season 1973/74 (t-1). In the last five rows of Table 1 the percentage changes of the five seasons following the stadium opening in comparison to season (t-1) is shown.

In total, 37 of the 44 calculated percentage changes are positive (84%), with only 7 negative (16%). The average increase for all stadia in the first season is 47%.⁷ Furthermore, the novelty effect appears to demonstrate some persistence, since after a period of five years, eight out of nine stadia⁸ demonstrate significantly higher spectator numbers than in the year prior to the completion of construction work.

– Table 2 –

Table 2, which presents spectator numbers in stadia constructed after 1998, shows analogously to Table 1 that not all clubs were actually present in the Bundesliga during the observation period. Hence FC Hansa Rostock and VfL Wolfsburg were only able to establish a medium-term presence in the Bundesliga in 1995/96 and 1997/98 respectively. The bandwidth lies between +18% and +98%. The average first season increase of all the stadia observed during this period was 33%. Moreover, the values not only point towards a persistence. The average number of spectators in the Hamburger SV's AOL-Arena for example has continued to increase in each of the five years since the opening of the new stadium. In the season 2003/04 the average was almost double that of 1998/99.

A difference-in-means comparison for the stadium projects in the category "1974 World Cup related" as described above (Table 3) shows that for nine out of ten of the stadia under consideration, the post-opening mean is greater than the mean prior to opening. This only does not apply to Hertha BSC Berlin and Berlin's Olympic Stadium. The largest increases can be observed in Dortmund and Stuttgart, with 92% each.⁹ In comparison with the average increases in the league over the same period, the increases following the opening of the new stadia are clearly higher as can be seen from columns 5 and 6 in Table 3.

– Table 3 –

The mean values of the pre-opening phase for Düsseldorf and the post-opening phase for Hannover are based on just one value in each phase and should therefore be interpreted with some caution. Table 4 summarizes the corresponding developments in spectator numbers for stadium projects after 1998.¹⁰

– Table 4 –

By way of an interim conclusion of the descriptive analysis we may say that, both with regard to the comparisons of individual seasons with each other and to the comparison of the mean values, with a few exceptions, the reconstruction of an existing stadium or the construction of a new stadium resulted in each case in an increase in the average number of spectators. This increase can be clearly seen in the first season in the new stadium

and in most cases demonstrates a recognisable degree of persistence. In particular for stadium projects after 1998, a clear and (hitherto) persistent effect can be ascertained.

A number of weaknesses should be noted that apply both to the comparisons of individual years with each other and to the comparison of mean values. A mean value comparison lacks, in particular, any control with regard to other influencing factors. The information value also suffers from its inherent susceptibility to the influence of exceptions. Thus a very high value for one of the five years (e.g. due to sporting success) can have a great influence on the mean value and give rise to a distortion in the direction of too high a novelty effect. In addition, any extension of capacity realised as part of the stadium project is not taken into consideration. The choice of the period for the determination of the mean values (e.g. five years prior to and after opening) is also arbitrary. Problems occur in particular when the new stadium is not a completely new building. Some of the new stadia were built in the same location as the old stadium whilst games continued to be held (e.g. the AOL Arena in Hamburg and the RheinEnergie Stadium in Cologne) which means that during a certain period the stadia were running at reduced capacity.

5. ECONOMETRIC ANALYSIS

The econometric analysis is based upon a fixed effects panel analysis using data which averages game-by-game data on a seasonal basis. Therefore the variable "average number of spectators for clubs in the Bundesliga per season" was created with the aid of the seasonal arithmetic mean of the 12,488 games played in the Bundesliga in the period 1963/64 to 2003/04 as published by the DFB (German Soccer Association) in the year 2004. The highest average number of spectators in the history of the Bundesliga was recorded by Borussia Dortmund in the 2003/04 season, with 79,647 per home game. This followed the third period of reconstruction since the mid-Nineties which saw the total capacity of the Westfalia Stadium increase to 83,000 for Bundesliga games. The absolute lowest average number of spectators was recorded by RW Oberhausen in the 1972/73 season with 6,941 spectators per home game. The highest average number of spectators taken across all the seasons observed here was once again attained by Borussia Dortmund with 37,997 spectators in 627 home games (37 seasons).

In view of the considerations discussed in sections II and III, the following values were used as explanatory variables of spectator demand:

- The regional income differences of the spectators are represented by the “average gross monthly earnings of salaried staff in trade and industry”. These figures are available for the entire period from 1964 to 2003, and are listed according to Germany's individual *Länder* (STATISTISCHES BUNDESAMT, various years). These nominal values were deflated with the aid of the CPI (Consumer Price Index) of the IMF (2004). This variable is called *INCOME*. Whilst older studies dealing with previous periods usually come to the conclusion stadium visits are inferior goods, so that increasing income leads to a falling demand, more recent studies usually come to the conclusion of a normal commodity.¹¹
- More recent studies on the demand behaviour of soccer stadium visitors tend to reject the thesis that the uncertainty of outcome is a central determining factor. By contrast, the emphasis is now on the sporting result of the home team (cf. PEEL and THOMAS, 1992). Consequently our calculations below also take home team wins into account. The first variable that depicts sporting success is *POS* which shows the final position in the league table that the individual teams have achieved in the season in question. A better league table position at the end of the season is assumed to lead to a higher number of spectators. There is however no need for a control of current or lagged sporting success of the guest teams when considering seasonal average spectator figures, since over the course of the season every team plays home games against every other team in the league. As further variables for the measurement of sporting success the dummy variables *DFB* and *EP*¹² are set to one in those (subsequent) years in which a club either won the DFB cup and/or one of the three European Cups (Champions League, UEFA Cup, UEFA Cup Winners' Cup).
- Weekend games (normally held at around 3.30 pm on Saturdays or 5.30 pm on Sundays) might have a higher number of spectators than weekday games, usually held at around 8.00 pm on Tuesdays, Wednesdays and Fridays. This applies in particular to visiting spectators who have to travel a long way to get to the match.

The effects that arise due to the Bundesliga matches played during the week were depicted by the variable *WQ*:

WQ = Number of home games during the week/ Total number of home games in the season

- In the literature on sports economics it is assumed that each individual club appears as a monopolist on its local market (VROOMAN, 2000). To this extent the average number of spectators per season could increase as the size of the local market increases. The number of inhabitants of cities (STATISTISCHES BUNDESAMT, 2004) with teams in the Bundesliga is represented by *POP* and has been ascertained for all the seasons in the observation period.

In order to take into consideration the fact that the catchment area of a Bundesliga team also extends beyond the boundaries of the team's home town – or that it may be limited by the geographical proximity of a league competitor – the market size is also depicted by the distance between the clubs. This takes into account the fact that a greater average distance to the other clubs means a larger regional market in which the club can act as a monopolist. There is an increase both in the number of potential fans and also in the number of individuals that have no (close) fan relationship to the local club, but who, for lack of alternative entertainment, nevertheless consume the commodity of a “stadium visit or event” during home team games. In this case the number of spectators would increase as the average distance to the next competitor increases. However, an opposite effect is also conceivable, since fans from the away team must also be seen as potential consumers of stadium visits.¹³ In such a case the “derby effect”¹⁴ resulting from the low average distance between the teams would lead to greater numbers of spectators. A variable corresponding to the average linear distance to the nearest rival assumes a geographically homogenous distribution of soccer fans. In reality however one should assume that such a constant relation does not exist. Rather we may presume that the readiness of soccer fans to travel to a league game is only given within a certain distance to the stadium. For this reason the following regressions make use of the distance-based variable *MARKET* which results from

the number of Bundesliga rivals for each team in a given season that can be found within a 100 kilometre radius from the team's home town.

- A number of sports economics studies concerned with the novelty effect of new or reconstructed stadium buildings use a variable in their econometric analyses that takes the capacity of the individual stadia into account (NOLL, 1974; COFFIN, 1996; POITRAS and HADLEY, 2003). The direct consideration of stadium capacity as an explanatory variable in a regression to ascertain the determinants of the demand for stadium visits is however problematic, both as a result of a possible multicollinearity of the capacity with other variables and as a result of an inadequate distinction between capacity effects and novelty effects. In the case of clubs that regularly have maximum capacity crowds in their stadia prior to the addition of supplementary capacity via construction or reconstruction works, it is unclear whether the increased demand following the opening of the new buildings really is due to the new stadium itself or whether it merely means that the already existing excess demand is being met. By contrast, for clubs that had a regularly underused stadium prior to construction or reconstruction works, no positive capacity effects on spectator demand can be expected. A variable that is designed to discriminate between novelty and capacity effects must therefore only take into account a change in capacity in the context of a stadium construction project when the capacity restriction was previously binding. To this end we have constructed the variable ΔCAP , which assumes the value of the percentage capacity change for clubs that displayed an average capacity utilisation of over 90% in the three seasons prior to the opening of the new stadium buildings.¹⁵

$$\Delta CAP = \begin{cases} \frac{CAP_t}{CAP_{t-1}} \cdot 100 & \text{for } \sum_{i=t-3}^{t-1} \frac{\text{capacity utilisation}_i}{3} > 0,9 \\ 0 & \text{for } \sum_{i=t-3}^{t-1} \frac{\text{capacity utilisation}_i}{3} \leq 0,9 \end{cases}$$

It is to be expected that the average number of spectators increases when ΔCAP is positive, given that in such a case it may be assumed that a capacity effect occurs – in addition to the novelty effect.

- The dummy variable *NE* is intended to isolate the novelty effect of a newly constructed or rebuilt stadium. Its design is oriented towards the theoretical progress of the novelty effect as discussed in Section III. Variant (a) assumes that a novelty value only exists in the opening season. Variant (b) assumes that the novelty value remains constant over the following five seasons, and assumes the value of zero for the subsequent seasons. In variant (c) the dummy variable assumes the value of one in the first post-opening season and then decreases in a linear manner over the following four seasons until it assumes a value of zero in the sixth season after the opening of the stadium.¹⁶
- In addition to the dummy variables for the novelty effect described here, a further dummy variable *CONSTR* should also be taken into account, which has a value of one in the season before opening and otherwise has a value of zero. This is in order to isolate the effects that occur during the construction phase, as described in Section III.
- Finally a further dummy variable is also taken into account which is intended to isolate the effects of the Bundesliga bribery scandal of the 1970/71 season. At that time a total of over 500,000 DM in bribes was paid to various different players and clubs (KICKER, 1993, p. 76). Since the accusations only came to light following the 1970/71 season, the dummy variable *BS* assumes the value of one for the 1971/72 season and the value of zero otherwise.

To start with, a Fisher-type test after MADDALA and WU (1999) and CHOI (1999) was carried out to examine the stationarity characteristics of the panel. To this end the following test statistic was calculated:

$$P = -2 \sum_{i=1}^N \ln p_i$$

This test combines the p -values of the unit root tests of every cross-section i , in order to test for roots of unity in the panel data. P here follows a χ^2 distribution with $2N$ degrees of

freedom (BALTAGI, 2001, p. 240). On the basis of this panel root test we may say that for the panel under consideration here, no problems occur with regard to the non-stationarity of the data. The following panel analysis is a so-called fixed effects model that registers the unobserved club-specific effects. The OLS regression model ultimately used is based on the following estimation equation:¹⁷

$$ATT_{it} = \alpha_i + \beta_1 INCOME_{it} + \beta_2 POS_{it} + \beta_3 WQ_{it} + \beta_4 \Delta CAP + \beta_5 MARKET_{it} + \beta_6 BS_{it} + \beta_7 NE_{it} + \varepsilon_{it}$$

The results of the regression are summarized in Table 5.¹⁸ The three variants are distinguished by the dummy variable *NE* used in the variants (a), (b) and (c) (cf. Illustration 1). The fixed effects α_i play no role in the subsequent interpretation of the results, but the values of the 48 fixed effects are given for the three different variants in Table 6 for the sake of completeness.

– Table 5 –

– Table 6 –

For the most part the fixed effects are significant at the 1% level. Only in the case of SpVgg Unterhaching is the fixed effect not significant on one of the customary levels in any of the three variants. In addition in variant (b) for SC Freiburg a significant fixed effect was only determined at the 10% level.

In addition to the independent variables listed in Table 5, the original estimates also tested the other variables described above. These include in particular the variables designed to register sporting success in a secondary competition. These are the variables *DFB* and *EP*, as well as the sub-forms of the latter *CL*, *UEFA* and *PS*. The variables were coded both for the current season in question as well as for previous seasons. It emerged that none of the described variables is significantly different from zero. The number of inhabitants (*POP*) of the home towns of the Bundesliga teams was also equally insignificant, as was the dummy variable *CONSTR*, which presumes a negative effect on spectator numbers during the construction phase. The omission of these variables produces no appreciable change in the regression coefficients and their significance measurements or in the quality criteria. For this reason the variables named here are not given in Table 5.

In all three variants a significantly positive income effect is evident. A visit to Bundesliga events can thus be regarded as a “normal commodity”. The final position in the annual

league table achieved by the individual clubs exercised a relatively high influence on spectator numbers. The regression coefficient has a negative leading sign, which results from the fact that the value of the position variable *POS* is lower for the league table leaders (1) than for the team at the bottom of the table (18, or in some years 16 or 20). On consideration of the regression coefficient it is evident that a one position decline in the final annual league table ranking of the home team translates into a decrease of between 445 and 465 in the average number of spectators per home game, depending on the variant in question. For example the difference between league table rankings one and ten amounted to 4,650 spectators on average and 79,050 spectators over the season as a whole. In order to take the past successes of the individual home teams into account, the estimates were also conducted with lagged forms of the *POS* variable. In none of the estimates was it possible to ascertain a significant influence of the past sporting successes on average spectator levels in the season under consideration.

The results of the regressions in Table 5 also indicate that the spectators prefer weekend games. This results from the significantly negative leading sign of the regression coefficient of the variable *WQ*, which gives the relative proportion of games on a weekday. This means that an additional match day during the week – this corresponds to a 2.95% increase of *WQ* – leads to a decrease of round about 50 spectators per game. The implementation of Monday evening game each match day (11% increase of *WQ*) as known from the English Premier League will lead to a decrease of about 190 spectators per game.

The variable ΔCAP is seen to be significantly positive at the 5% level in all three regression variants. It should be borne in mind here that the reason for including this variable had nothing to do with an independent interpretation of this variable. Rather, it is designed to assist in differentiating between any capacity and novelty effects evinced by a new stadium.

From the significant and negative leading signs of the regression coefficients of the variable *MARKET* we may conclude that the average number of spectators per game falls by 1,413 to 1,482 spectators with every Bundesliga club located within a 100km radius from the home team.

With regard to the variable *NE*, which is of decisive importance for the question formulated in this study and which depicts the novelty effect of a newly built or renovated stadium, it is worth pointing out once again that this variable has been taken into consideration in all of the estimates in the three variants described above. The regression coefficient of the variable *NE* is only positively significant in variant (*b*). Here newly built and renovated stadia lead to a novelty effect of around 2,700 spectators per game. This corresponds to a substantial increase of 10.7% against the mean value of 25,060 spectators per Bundesliga game (Table 6). In variant (*a*), which only assumes a novelty value in the first post-opening season, a regression coefficient significant at the 10% level still emerges, whilst the variable in variant (*c*) proves to be statistically insignificant. From the quality criteria of the three estimate variants we may conclude that the specification of the novelty effect that is prevalent over five years represents the best adaptation to reality.

Alternative estimates of the model were undertaken in order to test the robustness of the results.¹⁹ Firstly, a test was made whether the results of the OLS estimates conducted above are distorted by a censoring of the distribution of the dependent variables due to the potentially binding capacity limitations of the stadia. The subsequently estimated "censored regressions" or Tobit regressions are not however significantly divergent from those of the OLS regression. This may for example be due to the fact that the capacity limitation is only binding in rare cases.²⁰ Other studies on the estimation of demand for stadium visits that have undertaken both OLS and Tobit regressions also show no appreciable difference in the results of the two estimation methods (e.g. SZYMANSKI, 2001).

For the further assessment of robustness, OLS estimates were carried out with deviating dummy variables for the novelty effect. These altered dummy variables are fundamentally oriented towards the variant (*b*) for the novelty effect, which is active over a period of five years. Here the dummy variable *NE* is initially applied exclusively to those that were particularly emphasised in the context of the descriptive methods in Section IV (see Table 1 and Table 2). The coefficients of the otherwise unchanged variables generally differ only insignificantly from the results in Table 5. The novelty effect that can be determined on the basis of the interpretation of the corresponding regression coefficient does however climb to around 3,900 spectators per game and is hence clearly larger than the effect that

can be determined when all stadium construction projects are taken into consideration. This regression displays a R^2 of 0.630, and an adjusted R^2 of 0.601.²¹

A glance at the data for the stadia which have been constructed after 2000 seems to display a higher novelty effect. These stadia (especially the AOL-Arena in Hamburg and the Veltins-Arena in Gelsenkirchen) represent a new kind of stadia: With a few exceptions German (soccer) stadia traditionally had have an athletic track, causing a bigger distance between the spectators and the pitch. In the newly constructed soccer arenas the event character achieves a new dimension. Thus in a further estimation the novelty dummy was divided into two separate dummy variables. The first of these newly constructed dummies comprises the two locations Hamburg and Gelsenkirchen, whilst the second dummy covers all the other stadium construction projects in the period between 1963 and 2004. Both the dummy variables that are designed to register the novelty effect are significant at least at the 5% level. The novelty effect of the other stadium construction projects now stands at 1,528 spectators per game, whilst the regression coefficient for the novelty dummy relating to the projects in Hamburg and Gelsenkirchen is significantly higher with a value of 10,288. The R^2 of this regression is 0.637, whilst its adjusted R^2 is 0.608. In future it may be necessary to extend the group of new arenas. At least Munich (Allianz-Arena), Frankfurt (Commerzbank-Arena), Cologne (RheinEnergieStadion) should be added to this group.

6. CONCLUSIONS

The aim of this study was to register the effect of the construction of a new soccer stadium or the reconstruction of an existing stadium on spectator figures in Germany. To this end all the important stadium construction projects since the beginning of the Bundesliga (1963/64) were processed and data from all 12,488 completed games up to the end of the 2003/04 season was used.

Both the comparison of individual seasons with each other and the comparison of the mean values show that – with few exceptions – an increase in average spectator numbers followed on from the completion of a stadium construction or reconstruction project. This increase can be seen clearly in the first season in the new stadium and in most cases displays a recognisable degree of persistence. A multivariate panel regression

which, in addition to a dummy variable depicting the newly constructed stadium, tested for further influences on spectator behaviour, displayed a significant increase in the average number of spectators of around 2,700 spectators per season over a period of five seasons. This corresponds to an increase of 10.7% against the mean value of 25,060 spectators per game in the Bundesliga. This national value for Germany is significantly below the values calculated for the US-American professional leagues.

This minor effect was subjected to a series of tests for robustness. Thus the stadium construction projects were divided into two groups, with Hamburg and Gelsenkirchen on the one hand and all the other construction projects on the other. The novelty effect of the projects in Hamburg and Gelsenkirchen emerged at a value of 10,288, whilst that of all the other stadium building projects had a value of only 1,528 spectators per game.

The additional numbers of spectators hardly provide an adequate basis for clubs to undertake financially viable stadium construction or reconstruction projects. This can be demonstrated by an admittedly rough and "back of the envelope"-type calculation. Variant (b) of the panel regression resulted in a novelty effect of around 2,700 spectators per game that persisted over five seasons. Given 17 home games per season this means around 45,900 additional spectators per season. At an average ticket price of € 15.43²² this results in additional annual incomes for the club in question of around € 708,000. This corresponds to approx. 0.6% of the average volume of investment by the various funding bodies (central and regional government, local authorities and operating company) amounting to € 116,750,000 per stadium (FIFA 2004) in the context of the 12 stadium construction or reconstruction projects in the run up to the 2006 World Cup in Germany. This figure increases to around 3.0% when taken over the (entire) five year duration of the novelty effect.²³

When the projects are differentiated into the only stadium construction projects with a positive novelty value (Gelsenkirchen and Hamburg) and the remaining Bundesliga clubs, this assessment becomes even more severe for the remaining clubs, given that they can only reckon with around 1,500 additional spectators per game (cf. Section V). By contrast for Schalke 04 (Gelsenkirchen) and HSV (Hamburg) the novelty value from the panel analysis is significantly higher at 10,300. Basing our calculations on the above-mentioned average ticket price, this means an increase in revenue of around € 2.7 million²⁴ each,

corresponding to some 1.4% of Schalke's investment costs and around 2.8 % of HSV's investment costs. Even in these two cases, the additional revenues from increased spectator numbers are however still a long way from providing an adequate funding basis from which to pay off standard market interest and/or depreciation and amortisation. This is particularly true when, in line with the panel analysis, we assume that the novelty effect on which the calculations are based only persists for five years.

If newly constructed stadia are to be economically viable from a business management point of view, this can only be justified by the fact that at least in the stadium construction projects of the 2006 World Cup generation, new categories of tickets have been created with the introduction of business seats and VIP suites. It is however difficult to estimate the related income effects given the data presently available. Basing our calculations on the number of VIP and business seats per stadium and the published prices²⁵, the annual average income for the current Bundesliga clubs resulting solely from business seats and VIP suites stands at some € 8.1 million or 6.9% of the average investment volume for stadium construction or reconstruction projects. Schalke 04 allegedly draws some 40% of its spectator income from these two areas (n.n. 2003a, 44). However, even if such revenues are attainable in the long term, they are still hardly in a position to fund normal market interest payments or amortisation and depreciation with regard to the total investment sum.²⁶

In other words: any increased revenue effects from stadium construction and reconstruction projects essentially result not from the fact that more soccer fans are able to experience the game live, but rather that the buying power of a relatively low number of wealthy spectators is absorbed more effectively. If – and this is a question which would certainly be worth examining – the research results from the United States can be applied to Germany, then the fact that stadium construction and reconstruction projects exercise hardly any other significantly positive effects on the regional economy (cf. Section II), would mean that the extent to which public funding for soccer stadium buildings can be justified will be small indeed.

NOTES

* This analysis was funded by the German Federal Institute for Sports Science (VF 07/09/71/2004).. We like to thank two anonymous referees, the participants of the Joint Annual Meeting of the International Association of Sports Economists (IASE) and the Arbeitskreis Sportökonomie (AK) 2006 in Bochum, Germany as well as Peter Stahlecker, Florian Weinert and Philipp Zimmermann.

¹ In addition to a potential increase in the numbers of spectators, the possibility that following the construction of a new stadium the (weighted) ticket costs could increase should also be taken into consideration. This can result from the transformation of terraces or standing room into seating, as well as from increased numbers of VIP suites and business seats. In this case there is a disproportionately high increase in the novelty value as compared with the novelty effect. When questioned, clubs in the German Bundesliga were not prepared to provide any data in this respect (BOYÉ, 2004). Given that – with one exception – they are not listed on the stock exchange, they are not subject to publication requirements under German law. For a discussion on the relationship between public stadium funding and ticket prices see FORT (2004) and BROWN, RASCHER and WARD (2006).

² For more on the positive influence of stadium buildings on the earnings situation of the major league baseball clubs cf. DEPKEN (undated b, undated c) and POITRAS and HADLEY (2003). BROWN et al. (2004) are analysing the revenue effects on NFL teams. This is more comparable to German Bundesliga given the number of games.

³ For literature references to ex-ante studies that deduced positive effects on regional economic developments, cf. SIEGFRIED and ZIMBALIST (2000, p. 103), C.H. JOHNSON CONSULTING (1999), NOLL and ZIMBALIST (1997). By contrast, ex-post studies are rarely able to confirm this kind of effect (BAADE, 1996, p. 331; RICH, 2000; SIEGFRIED and ZIMBALIST, 2000; COATES and HUMPHREYS, 2005). For an analysis of the differences between the ex-ante and the ex-post studies cf. CROMPTON (1995) and KESENNE (undated).

⁴ Although club/stadium owners often try to combat this effect with the “see the last game in the old stadium before it is demolished” argument.

⁵ The 1974 World Cup was hosted in nine different stadia (Berlin, Dortmund, Düsseldorf, Frankfurt, Gelsenkirchen, Hamburg, Hannover, Munich und Stuttgart). The stadium in Cologne was not among the actual World Cup venues. However, as it was opened in 1975 – probably as a result of the large number of construction works in other cities - , it is included here in the 1974 period.

⁶ Because of this, for Dortmund for example the spectator figures for the last season in which the team was part of the Bundesliga (1971/72) were used as a basis for calculations, instead of the figures for the season in which the stadium was opened. The relevant percentage changes are thus given in brackets.

⁷ A related study by HOWARD and CROMPTON (2003, p. 113) shows an effect of + 22.2% for the first season for US-American stadia.

⁸ The Niedersachsenstadion in Hannover has not been taken into consideration here, since its home team, Hannover 96, has only played one season in the Bundesliga first division during the observation period of this study.

⁹ Due to the fact that the team was not in the Bundesliga during the given period, no data is available for average spectator numbers for the stadium in Stuttgart for two seasons in the post-opening period, and the corresponding mean value is calculated using three instead of five seasons. The situation for Dortmund is similar. In this case only three values are available for each of the two phases.

¹⁰ The analysis is necessarily incomplete, since at the time of the conducting of the analysis a number of projects were either incomplete or had not been completed for long enough.

¹¹ See CAIRNS, JENNETT and SLOANE (1986, p. 15-17) and the literature quoted therein for a discussion of the income elasticity of attendance.

¹² The variable *EP* includes all three European cup competitions. In addition an examination of the influence of the individual European cups was carried out with the aid of individual dummy variables *CL* (Champions League), *UEFA* (UEFA Cup) and *PS* (European Cup Winners Cup).

¹³ The case of FC Bayern Munich, that recruits its fans from across the entire country, points towards the possibility of a special case in this respect. If a team's fans can be found not only in the regional vicinity around the team's home town, but throughout the area covered by the league, then for certain away teams the number of "away fans" may increase as the distance to the team's home town increases. Cf. CZARNITZKI and STADTMANN (2002) for an indication of the regional distribution of soccer fans as well as for the geographical spread of the fan clubs.

¹⁴ In European team sports (especially soccer) the term "derby" is used to denote a sporting fixture between two rivalling local teams. This rivalry often comes from regional closeness. It can be distinguished between a city derby (e.g. Internazionale Milano FC vs. AC Milano) and a regional derby (e.g. Borussia Dortmund vs. Schalke 04). Derbies usually have a much more heated atmosphere between the fans and often the players of the two clubs (N.N. 2006).

¹⁵ The capacity data for Bundesliga club stadia for the seasons 1963/64 to 2003/04 are taken from SKRENTNY (2001) and KICKER (various years).

¹⁶ Also other variants of the dummy variable *NE* were tested. Variant (b) and variant (c) have been chosen because they showed the best fit according to the information criteria.

¹⁷ As the attendance data may be censored (see the discussion of the capacity restrains) one might justifiably ask if a censored or Tobit regression might be more appropriate. We carried out such regressions, since the results are quite similar to that from the OLS regression we decided to show the results of the established OLS regression. The results of the Tobit regression can be obtained on request from the authors.

¹⁸ No Problems with multicollinearity, heteroscedasticity, autocorrelation and non-normality can be reported. The test results can be obtained on request from the authors.

¹⁹ Detailed results of these alternative estimates also can be requested from the authors.

²⁰ Thus in 736 observations the degree of utilisation only reached 100% in six cases.

²¹ Details are available from the authors on request.

²² This figure represents the quotient from the total ticket revenues and tickets sold for Borussia Dortmund for the seasons 2000/01 to 2003/04, taken from the relevant annual business reports of the BORUSSIA DORTMUND GMBH AND CO. KGAA (various years). The figures for Dortmund were used because the club is the only one in the Bundesliga that publishes its ticket revenues. Hence only in this case was it possible to calculate a weighted average entry price.

²³ Besides the 17 league matches other events affect the income generated by a stadium. A stadium of a Bundesliga team potentially hosts some one to five national cup games, one to six international cup games and maybe one international match of the national team. In average there will be 20 to 25 soccer matches that attract spectators. There are also some events besides soccer like motocross, biathlon, church congress, operas as well as rock and pop concerts. In average there are three to ten additional events in a modern stadium.

²⁴ When calculations are based on the unweighted average entry price (excluding VIP suites and business seats) of the two clubs (<https://www4.sportfivetix.com/shops/workpad.php3> for HSV and http://www.schalke04.de/115_kartenpreise/kartenpreise.php for Schalke 04, both sites visited on 27.12.04) amounting to € 24.60, this results in a figure of € 4.3 million. This represents the maximum value, since for example none of the reduced ticket prices are included.

²⁵ On average the stadia of 15 of the 18 teams currently in the Bundesliga contain around 330 VIP suite seats and around 1,500 business seats, with tickets costing an average of around € 330 per VIP suite seat per game and around € 200 per business seat per game. Bielefeld and Mainz are excluded from this calculation due to lack of data, Munich was excluded due to the uncompleted construction works still in progress. If no individual data was available suite prices were calculated on the basis of 12 seats per suite, which corresponds to the average of the published values. All data was taken from N.N. (2003a-d).

²⁶ In addition the running costs of the individual stadia should also be taken into consideration, as these regularly increase on completion of a new stadium building.

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Table 1: Attendance per game and percentage change for world cup 1974 stadiums

Season	Berlin	Dortmund	Düsseldorf	Frankfurt	Gelsenkirchen	Hamburg	Hannover	Munich	Stuttgart	Cologne
1967/68	-	21.882	-	20.265	22.765	19.265	22.371	21.765	23.971	23.176
1968/69	44.176	22.824	-	20.765	23.412	21.059	22.706	25.029	20.482	24.882
1969/70	42.529	19.412	-	17.294	20.118	17.765	23.294	23.324	21.147	25.118
1970/71	45.529	20.000	-	22.676	20.676	17.235	22.029	24.088	18.500	17.971
1971/72	24.588	18.118	15.412	21.059	28.529	17.000	18.500	27.882	21.300	15.118
1972/73	22.588	-	26.118	13.912	21.412	18.118	17.600	33.353	14.029	12.753
1973/74	27.588	-	23.912	24.412	42.441	24.735	20.535	37.588	27.571	17.135
1974/75	36.235	-	22.235	23.788	39.988	31.941	-	36.412	26.599	18.500
1975/76	22.147	-	18.324	21.529	34.212	32.059	28.365	32.971	-	25.941
1976/77	25.400	43.282	20.471	23.982	37.576	34.647	-	31.550	-	32.306
1977/78	25.047	37.843	22.576	26.018	35.694	31.235	-	30.876	55.559	35.235
1978/79	16.735	29.241	18.935	25.824	34.218	42.441	-	34.153	41.412	22.765
$\Delta(t-1; t)$	+ 31 %	(+ 139 %)	+ 69 %	- 3 %	+ 98 %	+ 29 %	-	+ 20 %	+ 97 %	+ 40 %
$\Delta(t-1; t+1)$	- 20 %	(+ 109 %)	+ 55 %	- 12 %	+ 87 %	+ 30 %	+ 38 %	+ 35 %	+ 90 %	+ 75 %
$\Delta(t-1; t+2)$	- 8 %	(+ 61 %)	+ 44 %	- 2 %	+ 60 %	+ 40 %	-	+ 31 %	-	+ 90 %
$\Delta(t-1; t+3)$	- 9 %	(+ 91 %)	+ 19 %	+ 7 %	+ 75 %	+ 26 %	-	+ 18 %	-	+ 23 %
$\Delta(t-1; t+4)$	- 39 %	(+ 90 %)	+ 33 %	+ 6 %	+ 67 %	+ 72 %	-	+ 13 %	+ 296 %	+ 50 %

Table 2: Attendance per game and percentage change for stadiums build after 1998

Saison	Dortmund	Gelsenkirchen	Hamburg	Rostock	Wolfsburg
1993/94	42.074	35.501	31.347	–	–
1994/95	42.784	39.883	30.445	–	–
1995/96	43.981	38.310	27.922	26.836	–
1996/97	53.053	39.540	29.607	19.071	–
1997/98	54.206	50.256	33.105	18.841	17.083
1998/99	65.494	43.555	24.361	15.953	16.693
1999/00	64.629	40.518	41.314	16.188	17.137
2000/01	63.729	46.496	43.371	14.894	15.791
2001/02	66.206	60.450	44.445	18.464	14.013
2002/03	67.859	60.584	45.621	20.212	19.415
2003/04	79.647	61.143	48.275	22.206	23.046
Δ (t-1; t)	+ 21 %	+ 30 %	+ 70 %	+ 24 %	+ 39 %
Δ (t-1; t+1)	+ 19 %	+ 30 %	+ 78 %	+ 36 %	+ 64 %
Δ (t-1; t+2)	+ 18 %	+ 32 %	+ 82 %	+ 49 %	–
Δ (t-1; t+3)	+ 22 %	–	+ 87 %	–	–
Δ (t-1; t+4)	+ 25 %	–	+ 98 %	–	–

Table 3: Mean of attendance per game and percentage change for world cup 1974 stadia

Stadium	Year of opening	Mean of attendance per game (5 years)			Changes of the league mean
		Pre opening	After opening	Changes	
Berlin	1974	32.565	25.113	- 23 %	+ 24 %
Dortmund	1974	19.176	36.789	+ 92 %	+ 24 %
Düsseldorf	1972	(15.412)	22.212	(+ 44 %)	+5 %
Frankfurt	1974	19.871	24.228	+ 22 %	+ 24 %
Gelsenkirchen	1973	22.829	37.982	+ 66 %	+ 19 %
Hamburg	1974	18.971	34.465	+ 82 %	+ 24 %
Hannover	1974	20.392	(28.365)	(+ 39 %)	+ 24 %
Cologne	1975	16.295	28.814	+ 77 %	+ 22 %
Munich	1972	24.418	34.375	+ 41 %	+ 5 %
Stuttgart	1973	19.092	36.576	+ 92 %	+ 19 %

Table 4: Mean of attendance per game and percentage change for stadia build after 1998

Stadium	Year of opening	Mean of attendance per game (5 years)			Changes of the league mean
		Pre opening	After opening	Changes	
Dortmund	1998	47.219	65.584	+ 39 %	+ 6 %
Gelsenkirchen	2001	42.068	56.523	+ 34 %	+ 10 %
Hamburg	1999	28.522	43.158	+ 51 %	+ 5 %
Rostock	2001	16.989	20.294	+ 19 %	+ 10 %
Wolfsburg	2002	16.143	21.231	+ 32 %	+ 11 %

Table 5: Novelty effect: panel regression

Variable	(a)	(b)	(c)
INCOME	6.428 *** (10.414)	6.215 *** (10.273)	6.424 *** (10.433)
POS	-461.613 *** (-7.864)	-444.766 *** (-7.672)	-465.061 *** (-7.929)
WQ	-17.210 *** (-5.033)	-15.678 *** (-4.586)	-16.889 *** (-4.933)
ΔCAP	195.430 ** (2.194)	173.740 ** (2.001)	193.552 ** (2.162)
MARKET	-1,456.352 *** (-4.549)	-1,413.023 *** (4.509)	-1,482.600 *** (4.553)
BS	-3,421.247 *** (3.373)	-3,193.827 *** (-3.183)	-3,294.492 *** (3.185)
NE	2,555.168 * (1.766)	2,698.640 *** (3.567)	1,258.095 (1.642)
N	736	736	763
Mean	25,059.840	25,059.840	25,059.840
R ²	0.618	0.624	0.617
adj. R ²	0.587	0.594	0.586
F-statistic	20.370 ***	20.917 ***	20.297 ***

Notes: *** p<0,01 ; ** p<0,05 ; * p<0,10; White heteroskedasticity consistent t-statistics are given in parentheses.

Table 6: Novelty effect: fixed effects

Verein	(a)	(b)	(c)
Bayern München	27.078 ***	27.054 ***	27.043 ***
Hamburger SV	18.785 ***	18.469 ***	18.728 ***
Werder Bremen	13.720 ***	13.508 ***	13.678 ***
VfB Stuttgart	19.846 ***	19.634 ***	19.831 ***
1. FC Köln	24.190 ***	23.829 ***	24.343 ***
1.FC Kaiserslautern	18.745 ***	18.370 ***	18.729 ***
Borussia Mönchengladbach	20.293 ***	19.971 ***	19.982 ***
Borussia Dortmund	33.581 ***	33.033 ***	33.734 ***
Eintracht Frankfurt	16.276 ***	16.126 ***	16.256 ***
FC Schalke 04	30.986 ***	30.844 ***	31.132 ***
Bayer 04 Leverkusen	12.876 ***	11.605 ***	12.894 ***
VfL Bochum	21.601 ***	21.081 ***	21.734 ***
MSV Duisburg	20.272 ***	20.109 ***	20.429 ***
Hertha BSC Berlin	26.452 ***	26.087 ***	26.398 ***
1. FC Nürnberg	21.152 ***	21.036 ***	21.151 ***
Fortuna Düsseldorf	21.350 ***	20.668 ***	21.473 ***
TSV 1860 München	21.400 ***	21.549 ***	21.445 ***
Karlsruher SC	19.979 ***	19.161 ***	19.932 ***
Eintracht Braunschweig	14.013 ***	14.031 ***	14.029 ***
Hannover 96	21.227 ***	20.888 ***	21.220 ***
KFC Uerdingen	13.394 ***	11.665 ***	13.885 ***
Arminia Bielefeld	13.383 ***	12.786 ***	13.490 ***
Hansa Rostock	12.484 ***	12.043 ***	12.466 ***
SC Freiburg	5.958 **	5.083 *	6.227 **
VfL Wolfsburg	5.837 **	5.336 **	5.796 **
SVW Mannheim	12.545 ***	12.507 ***	12.613 ***
Kickers Offenbach	15.306 ***	14.089 ***	15.214 ***
RW Essen	24.675 ***	24.415 ***	24.880 ***
FC St. Pauli	13.149 ***	13.207 ***	13.188 ***
Wattenscheid 09	14.301 ***	14.107 ***	14.498 ***
Dynamo Dresden	12.569 ***	12.610 ***	12.609 ***
1.FC Saarbrücken	20.117 ***	20.016 ***	20.161 ***
RW Oberhausen	21.681 ***	21.261 ***	21.821 ***
Alemania Aachen	17.245 ***	17.186 ***	17.314 ***
Energie Cottbus	8.909 ***	9.064 ***	8.956 ***
Wuppertaler SV	20.040 ***	19.801 ***	20.235 ***
Borussia Neunkirchen	16.445 ***	16.397 ***	16.520 ***
FC Homburg	5.451 ***	5.382 ***	5.489 ***
SpVgg Unterhaching	2.343	2.479	2.414
Stuttgarter Kickers	7.995 ***	7.984 ***	8.069 ***
SV Darmstadt	13.126 ***	13.120 ***	13.206 ***
TB Berlin	11.083 ***	11.094 ***	11.157 ***
SSV Ulm	14.257 ***	14.393 ***	14.311 ***
Fortuna Köln	20.612 ***	20.257 ***	20.823 ***
Preußen Münster	26.757 ***	26.466 ***	26.823 ***
Blau-Weiß Berlin	19.335 ***	19.020 ***	19.293 ***
VfB Leipzig	7.979 ***	8.079 ***	8.048 ***
Tasmania Berlin	18.668 ***	18.536 ***	18.715 ***

Notes: *** p<0,01 ; ** p<0,05 ; * p<0,10.