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Live Broadcasting, Gate Revenue, and Football Club Performance: Some Evidence

ADAM COX

ABSTRACT *This paper presents new evidence concerning the main argument of the English Premier League for collective arrangements in selling television broadcast rights. Matches that are broadcast live on television can be considered as a substitute for watching at the stadium. New panel-data show that broadcasting live has a small negative effect on gate revenue for the best performing clubs and a much larger effect for the worst performing clubs. However, the marginal cost is outweighed by the marginal revenue, concluding that restrictions on quantity stemming from collective arrangements are detrimental to the consumers, broadcasters, and clubs themselves.*

Key Words: Premier League; Football; Attendance; Broadcasting Rights; Collective Selling.

JEL classifications: D43, D71, K21, L13, L83, L88.

1. Introduction

Since its creation in 1992, the English Football Association Premier League (PL) has attracted large audiences and with it large revenues for the rights to broadcast live matches on television. The 20 PL clubs act collectively in the sale of broadcast rights, worth £594 million per year, 2010–2013. The quantity of broadcast games is restricted to roughly one third of the total 380 matches played per season. Unlike the Italian and Spanish leagues, individual clubs are prevented from selling the rights to their own games directly to a broadcaster, even though these would not otherwise be broadcast.

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The concern is that the PL is acting as a cartel, restricting output and depriving consumers of the benefits of viewing more football matches in such a way that only pay-TV companies, such as BSkyB, can afford to purchase the rights. Although contrary to government competition guidelines, restrictive practices have been allowed to continue. Until 2007, UK football fans could only watch live PL matches on television by subscription to Sky Sports, owned by BSkyB. The European Commission has attempted to remove the exclusivity of BSkyB by ruling that rights have to be sold to more than one broadcaster. Despite this regulatory intervention, the power of the single seller and the dominance of BSkyB arguably still distort the market.

The PL states that this collective arrangement is an efficient way to organise the selling of broadcast rights, benefiting all parties concerned (European Commission, 2002). The main argument put forward by the PL is that matches broadcast live on television can be considered as a substitute for watching at the stadium. Restricting the quantity of live broadcasts limits the potentially negative effect of lower attendance at the stadium and limits reduction of support due to overexposure in the long run. The PL has argued that any increase in revenues from selling additional rights would be offset by the loss of gate receipts at the matches, as attendances would fall.

This study aims to analyse this argument for collective behaviour put forward by the PL. The effect of live broadcasting on match-day gate revenue is estimated. This has been attempted a number of times in the literature. However, this study uses a four-season-long data set from 2004 to 2008. This more recent data have been not previously tested, to the author's knowledge, and include the first-year Setanta-acquired broadcasting rights due to the European Commission's involvement. Furthermore, the estimation model provides results for the PL as a whole, the "top four" clubs (Arsenal, Chelsea, Liverpool, and Manchester United), and the worst performing clubs. This method accounts for the underlying endogeneity problem that the most popular matches are the matches televised.

This paper continues by reviewing the existing literature and theory in this area. This is followed by outlining the sports broadcast market and the auction history of the PL with the involvement of the European Commission. The fourth section models and estimates the effect of live broadcasts on club gate revenue. The fifth section discusses the results from fixed effects estimation and the impact of these findings on the PL clubs, the broadcasters, and the consumers. The final section concludes.

2. Literature

The empirical literature concerned with the economics of professional team sports focuses mainly on analysing the factors affecting the demand.¹ Early studies of demand for sports restricted attention to one specific determinant that may affect attendance. Davenport (1969) compares attendances in years where competition was close with the years when competition was not close. Canes (1974) studies the correlation between attendance and a club's league position. Heilmann and Wendling (1976) look at attendance with normal and discounted ticket prices. These papers shared the obvious weakness that they assume all other factors are being held constant, yet make no attempt to use controls to that effect.

More rigorous studies by Hart *et al.* (1975) and Noll (1974) consider the functional form of the demand equation for sports, including the roles of market size, price, and income. In a study on the Scottish football league, Jennett (1984) furthers the use of control variables by including the market size of the travelling supporters. This is more applicable in the UK than in the United States due to the shorter distances between stadiums. However, these studies use cross-section or time series data with a short depth of time, for example, one season. Overcoming this shortfall in a study on the English football league, Bird (1982) uses a time series data set that spans 22 seasons. However, the focus is mainly on economic control variables, such as income and price, with little consideration given to underlying econometric issues.

As highlights of football matches were the only televised football, the impact of live television broadcasting of matches is largely ignored until the end of the last century, with the exception of a handful of papers. Hart *et al.* (1975) and Peel and Thomas (1988) suggest that the televised sporting event is specifically an alternative attraction to the original event. Bird (1982) notes that televised football highlights may be popular but chooses not to incorporate this in modelling demand.

A frequently cited study on attendance at PL matches during the 1993–1994 season by Baimbridge *et al.* (1996) uses a wide range of control variables such as outcome uncertainty, match quality, and age of the team. The study finds that matches televised on Mondays reduce attendances at the stadiums by 15%, but do not affect games broadcast on Sundays. This result is criticised by Forrest and Simmons (2006) for failing to use alternative econometric methods of estimation, rendering the inference questionable. In contradiction to Baimbridge *et al.* (1996), Kuypers (1996) finds no significant impact of live television on attendance in any estimation.² However, Forrest *et al.* (2004) show that the effect of broadcasting on match attendance in English football is mixed and dependent on a combination of broadcaster and the platform on which it is viewed.

Forrest and Simmons (2006) examine the impact of televising different, and possibly more attractive matches, on stadium attendance in different leagues in England. This study shows that broadcasting Union of European Football Associations (UEFA) Champions League matches has a negative impact on attendance of league football. This effect is much stronger when games are broadcast on free-to-watch rather than subscription channels. In criticism, Allan and Roy (2008) argue that these studies focus only on aggregate attendance at matches, and so it is not possible to evaluate the impact of broadcasting on different categories of spectators. Allan and Roy (2008) find that the majority of variance in the attendance for football matches comes for consumers buying tickets “at the gate”, whereas season-ticket holders are much less effected by match-day-specific characteristics.

Borland and Macdonald (2003) suggest the evidence of how live broadcasting affects attendance is weak due to a relatively small number of studies and a lack of consistent results. Further, Borland and Macdonald (2003) attribute this inconsistency to econometric issues underlying the estimation. There is an endogeneity problem with the observations: on average, the attendance will be higher for televised matches. Simply, broadcasters wish to broadcast the most popular games in order to attract strong television advertising revenues. As

indicated in the study by Buraimo *et al.* (2009), this endogeneity is likely to bias the effect of broadcasting upwardly.

Buraimo *et al.* (2009) uses what he describes as a “full” set of control variables to isolate the impact of televised games on attendance. These control variables are the characteristics that will attract or discourage supporters to attend the match at the stadium. The study by Baimbridge *et al.* (1996) contains a large number of control variables and remains one of the most heavily cited amongst the literature for its use of these controls. Other studies³ use only a limited set of control variables, adding to the inconsistency in the literature by estimating the broadcasting effect to be between 9.5% and 56%. Although estimating with a number of these control variables, Allan (2004) uses the data for one season and one football club to show that these findings arguably do not reflect the effect of broadcasting for the PL at 7.7%.

The theoretical literature stems from many issues with the structure of professional sports markets across the globe. A paper by Neale (1964) distinguishes the difference between sporting competition and economic competition to address the paradox that a monopoly is less profitable than competition in sports industries. It is this work by Neale (1964) that has allowed legislators to give sports leagues the power to practice collective decision-making behaviour. Where this would usually appear as anti-competitive behaviour, Neale (1964) argued that the “firm” in professional sports markets is the league not the individual clubs. A sports league, as a firm, then competes against other types of sports for their fans. This gave way to the idea that clubs must cooperate with each other in joint production of matches in a league competition. The league itself is therefore a natural monopoly provider and will supply the entire market. In the case of the PL, Sloane (1971) disputes the conclusion of Neale (1964) by arguing that joint decisions of production and price are not enough to elevate the league to the status of a firm, and in fact the league is a cartel. Sloane (1971) further brings to light that the assumptions of Neale (1964) and of Rottenberg (1956) – that sports clubs behave in the conventional profit maximising manner – are misplaced in the English football market. Football clubs making profit are few and far between, with the driving ambition being success on the playing field. The pursuit of non-profit objectives then leaves cause for regulation over market, such as revenue sharing, to distribute the allocation of player talent more evenly between richer and poorer clubs.

A study by El-Houdiri and Quirk (1971) presented a mathematical framework to formalise these earlier ideas⁴ and is now a standard analysis of competitive balance in sports leagues. Under the profit-maximising assumption as per El-Houdiri and Quirk (1971), studies by Boyd and Boyd (1996) and Ferguson *et al.* (1991) try to give a theoretical explanation for the usual empirical finding that demand for sport is relatively price inelastic. This may also be explained in a context where teams have objective functions other than profits, as proposed by Sloane (1971). In a review of existing literature, Borland and Macdonald (2003) express the live broadcast of a match in terms of microeconomic consumer theory as a direct substitute for attendance at the stadium. This framework forms the basis of a number of estimated models in the literature.

Falconieri *et al.* (2004) present a theoretical model to examine under what conditions a collective agreement for the sale of broadcast rights generates a welfare loss. Using consumer preferences, the model derives the price of and the demand for a match at a given quality. Falconieri *et al.* (2004) conclude that

a collective selling method can benefit a league with weak bargaining power containing a large number of teams that differ in quality where the reward for success is large.

Using the same framework as Falconieri *et al.* (2004), Dietl and Lang (2008) analyse the welfare effect of alternative gate revenue sharing methods. This study shows that gate revenue sharing can in fact decrease competitive balance, driven by what Dietl and Lang (2008) call the dulling effect of revenue sharing, albeit given some restrictive assumptions. Further, the study shows that a non-cooperative league can attain a higher degree of social welfare and aggregate profit. This leads to the conclusion that revenue sharing can be used to promote social welfare and club profits.

In contrast to Falconieri *et al.* (2004), an essay by Noll (2007) argues that collective selling methods do not improve competitive balance or benefit poorer clubs. This argument considers the assumptions made by most policy-makers, in particular that every club in a league can utilise additional revenue homogenously. Relaxing this assumption leads to the conclusion that any additional revenue given to each club will have differing effects on the team's competitiveness, therefore creating a more unbalanced league.

In the context of the existing empirical literature, this study sets out to estimate the effect of broadcasting using control variables and new data across a period of four seasons. The method tries to overcome an endogeneity problem by splitting the most popular matches and the least popular matches into separate data sets, then estimating the effect of broadcasting in each case. These empirical findings will show some evidence, in the context of the existing theoretical literature, concerning the key argument for the PL's collective method of selling broadcast rights to football matches.

3. Industry Background

The PL acts collectively in selling broadcast rights, stopping individual clubs selling live games that are not in preset packages. It is reasonable to assume that the PL seeks to maximise the profit obtained from the sale of rights. It may also be argued that the clubs themselves often seek other goals, such as league points' maximisation, thus requiring this collective guidance by a central body. The disadvantage of this collective selling is the ability of the PL to fix the price of the overall package at a disproportionately high level. It is able to do this by restricting access to the market, not allowing broadcasters to negotiate with individual clubs, instead forcing them to buy a complete package from the central negotiating body. Further, the PL can limit overall output by restricting the number of games that can be televised. As both of these restrictive practices occur with the collusion of the member clubs, the risk is that the PL could be distorting the market for its product contrary to Article 81 (1), or abusing its dominant position in the market as the sole seller of the rights contrary to Article 82 of the European Commission Treaty (now Article 101 and 102 of the Treaty of the European Union).

Two broadcasters, BSkyB and Setanta, acquired the exclusive rights to broadcast live PL matches for a lump-sum fee, selling the programming to its own subscribers and to its competitors for a per-subscriber monthly fee. Table 1 shows the contract details of these rights since 1983. From 1992, BSkyB has

Table 1. Auction history of broadcast rights

Year	Length of contract (years)	Broadcaster	Live matches per season	Total rights fee (£m)	Annual rights fee (£m)	£m per live match	Change in per match fee (%)
1983	2	BBC / ITV	10	5.2	2.6	0.26	
1985	0.5	BBC	6	1.3	2.6	0.43	0.67
1986	2	BBC / ITV	12	6.2	3.1	0.26	-0.40
1988	4	ITV	18	44	11	0.61	1.37
1992	5	BSkyB	60	191.5	38.3	0.64	0.04
1997	4	BSkyB	60	670	167.5	2.79	3.37
2001	3	BSkyB	110 ¹	1200	400	3.64	0.30
2004	3	BSkyB	138²	1024	341.3	2.47	-0.32
2007	3	BSkyB/ Setanta³	138	1706	568.7	4.12	0.67
2010	3	BSkyB/ Setanta ³	138	1782	594	4.30	0.04

¹2001-2004 contract was for 66 games and up to 40 on a pay-per-view basis (PremPlus).

²2004-2007 contract was for 88 games and up to 50 on a pay-per-view basis (PremPlus).

³At the time, there were no data on how much ESPN bought Setanta's rights for. Source: Adapted from OFCOM.

been the only broadcaster able to acquire rights to live matches from the PL, at a cost of between £0.64 million and £3.64 million per match. Although the number of games broadcast per season has risen from 60 (1992) to 138 (2004), the cost has risen from £38.3 million (1992) to £341.3 million (2004).

This dominance by one broadcaster has meant BSkyB can prevent the dissipation of monopoly profits by increasing the marginal cost of the resale rights to its competitors, that is, by raising rivals' costs while increasing the opportunity cost of serving BSkyB customers. The high resale price weakens downstream price competition and extracts consumer surplus, depriving consumers of the benefits of competition. The power of BSkyB is reflected first in the 2004 auction: despite the PL's collective power, as no other broadcaster could compete, BSkyB negotiated a price decrease from £3.64 million to £2.47 million per game. The contract was 110 games for £400 million, negotiated to 138 games for £341.3 million per season. Second, a ruling by the government regulator Ofcom in March 2010 meant that BSkyB were forced to reduce the wholesale prices of Sky Sports channels to competing broadcasters to £17.14 per month. From August 2010, BT offered customers Sky Sports 1 and 2 for £11.99 per month. In response, BSkyB increased the price of these channels to its own customers by £3 per month, therefore increasing the wholesale price under the new regulations to £19.07, increasing BT's marginal loss to £7.08 per month.

Collective selling, when coupled with exclusivity, means that only the large broadcasters can afford the acquisition of rights. This leads to higher prices and the shutting out of competitors from key broadcasting content. Football fans are further harmed by less PL football coverage on television, or none at all if they do not subscribe to the broadcasting channel.

In 2003, under pressure from the European Commission, the PL changed the format of its auction by splitting the broadcast rights into three packages. This decision was to give consumers a choice of broadcaster. After further pressure, there are now six packages of 23 games, each package of equal attractiveness, for the auction of 2007 and 2010, shown in Table 2 (Cave and Crandall, 2001).

The European Commission has allowed collective selling to continue but attempted to remove exclusivity by stopping BSkyB purchasing all six packages of rights. The aim is to introduce more competition to BSkyB, not to create competition between the clubs, and to make more games more widely available to fans. The description of the packages purchased by the two broadcasters in the 2007 and 2010 auctions are shown above in Table 2. The rights fees are shown in Table 3. In 2007, BSkyB paid £4.76 million per match for 92 matches per season, Setanta paid £2.84 million per match for 46 matches a season. In 2010, Setanta only secured one package of 23 games; BSkyB acquired the remaining 115 games for £4.70 million per match.

Splitting the rights between multiple broadcasters should expose them to greater competition at the upstream level whilst allowing consumers to choose the product from different providers, in theory leading to lower prices. In practice, the second broadcaster, Setanta, subsequently lost the rights after failing to meet payments to the PL in 2009. Although the American broadcaster, ESPN, has taken over the rights previously owned by Setanta, there is still apprehension about the dominance BSkyB asserts in this market.

Table 2. Broadcast rights packages for auction after European Commission involvement

Package	Broadcaster	Details
A	Sky	23 first-choice matches shown at 4.00pm on Sundays
B	Sky	23 second-choice matches shown at 1.30pm on Sundays
C	Setanta	23 third-choice matches shown at 8.00pm on Mondays
D	Setanta	8 second-choice matches + 15 fourth-choice matches shown at 5.15pm on Saturdays
E	Sky	5 first-choice matches + 9 third-choice matches + 9 fourth-choice matches shown at 12.45pm on Saturdays
F	Sky	10 first-choice matches + 7 second-choice matches + 6 third-choice matches shown midweek and bank holidays, Saturdays

Table 3. Details of the fees paid by broadcasters

Year	Length of contract (years)	Broadcaster	Live matches per season	Total rights fee (£m)	Annual rights fee (£m)	£m per live match
2007	3	BSkyB	92	1,314	438	4.76
	3	Setanta	46	392	130.7	2.84
2010	3	BSkyB	115	1,623	541	4.70
	3	Setanta	23	159	53.0	2.30

The protection against competition policy was originally granted for the auction of 1992. The European Commission gave leniency towards the PL and Sky contract in light of a pending merger between Sky and British Satellite Broadcasting to form BSkyB. The leniency in subsequent auctions has remained.

4. The Data

Data have been collected for each of the 20 teams in the PL across four seasons, 2004–2005 to 2007–2008 (each season consists of 380 matches: 19 home matches and 19 away matches for each of the 20 teams, a total of 1,520 observations). Certain financial data are unavailable for Aston Villa during the 2006–2007 season, Middlesbrough during the 2004–2005 and 2005–2006 seasons, and West Ham during the 2007–2008 season. After removing these, observations are reduced from 1,520 to 1,369.

4.1. The Dependent Variable – Gate Revenue

The stadium attendance figures for each match are taken from respective editions of the Sky Sport Football Yearbook (Rollin, 2004–2009) released annually. Ticket-pricing policies can vary between teams. For example, Portsmouth FC will charge different ticket prices depending on seat location, £41 for the best seats and £34 for the worst view, regardless of the visiting team (Portsmouth FC website); Arsenal FC change their ticket prices depending on the status of

the visiting team, as well as the seat location, £46 to £94 for tier A games and £32 to £66 for tier B games during the 2007–2008 season (Arsenal FC website). Tier A matches are usually those versus the “big four” teams, although some clubs will include local derbies or teams of particular interest or intense rivalry. Tier B matches are typically against teams positioned lower in the PL table. Although prices vary from year to year, with generally a small increase each year, this study assumes that the pricing policy remains the same, with the exception of Wigan FC in the 2007–2008 season. In an attempt to attract fans to support the struggling Wigan FC, ticket prices were reduced to £15 or £20 for selected games (ESPN, 2007). Behaviour of football fans follows that of high switching costs; in short, fans are unlikely to switch allegiance between teams because one team offers lower ticket prices than another. Instead, they may be less inclined to attend the matches when prices are perceived as too high (Buraimo and Simmons, 2006).

If the collective selling of broadcast rights by the PL was restricting supply of matches on TV to allow clubs to raise more gate revenue, this could be via higher ticket prices or higher attendance or both. As this effect might not be shown purely through attendance numbers, gate revenue is used. Match-day *gate revenue* is calculated by multiplying the stadium attendance with the average ticket price at that match; this is an approximate measure of match-day revenue. Other revenues from stadium advertising and sales of merchandise and food and beverages are hard to measure precisely for every match, so an approximate measure is appropriate. The dummy variable *TV* is constructed to capture when the match is broadcast live. For the 2007–2008 season, 138 matches were shown between two providers: Sky Sports (92 matches) and Setanta (46 matches). For all other seasons in the data set, Sky Sports is the sole provider of 138 live PL matches per season.

To analyse the effect of broadcasting live matches, other factors influencing the gate revenue must be accounted for and held constant. These determinants are grouped into six categories: geographic and demographic variables, economic variables, attractiveness of the match, the strength of the nearest substitute, exogenous variables, and seasonal and day dummy variables.

4.2. Control Variables

Full details of the data sources are shown in Appendix I.

4.3. Geographic and Demographic Variables

Gate revenue will potentially be a function of the market size a club has (Baimbridge *et al.*, 1996). The population of the Unitary Authority (UA) local to the team's stadium is expressed in terms of the land area of the UA. This measure is the *population density*, and as it is expressed relative to land area, it is comparable across each team. Attendance may also depend on the *distance* between the home and visiting teams' stadiums. This is an approximation for travel cost; higher travel costs may reduce the travelling supporters' attendance at a match, thus reducing the home team's gate revenue. Forrest *et al.* (2004) found that distance affected gate attendances negatively but at a diminishing rate. For that reason, distance squared is also included in the data.

4.4. Economic Difference between the Areas of each Team

The average male weekly *earnings* of residents surrounding the football club may affect gate revenue on match days. Attendance can be viewed as an inferior good (Baimbridge *et al.*, 1996), but the nature of supporting a football team can often mean a lifelong following regardless of income. For this reason, a quadratic relationship is considered. Differences in economic activity can be approximated by the local *unemployment rates*. Lower levels of economic activity and higher unemployment may cause a reduction in gate revenue.

4.5. Popularity or Attractiveness of the Football Match

There is strong evidence that supporters place high importance on matches between neighbouring teams reflecting often long-standing passionate rivalry, for example, Liverpool and Everton (0.9 miles apart) or Newcastle and Sunderland (12.7 miles apart). Allan and Roy (2008) include a variable for a *derby* match that is equal to 1 for matches that involve two local teams and 0 for all other matches. The distance is restricted to 34.7 miles, covering the North East derby between Middlesbrough and Sunderland (34.7 miles apart) and the North West derby between Manchester United and Liverpool (33 miles apart). Similarly a variable is added to every match played containing one of the “*top four*” teams. Any match against Manchester United, Chelsea, Liverpool, and Arsenal will tend to attract particular attention.

Teams’ *wage bills* can also capture match attractiveness. The competitive and mobile labour market in English football means that players can frequently move between teams in order to maximise their wages. Therefore, player wages are likely to reflect players’ marginal revenue products. Given this competitive market for players, the wage bill is likely to be a strong predictor of team strength (Buraimo, 2007; Forrest *et al.*, 2004). This study uses the wage bills, taken from various issues of the Deloitte Annual Review of Football Finance, divided by the PL’s average for the respective season. This measure is used because it is the relative quality of a team that is important.

With ever more PL clubs attracting foreign ownership and consequently large investments, willingness to spend on player transfer fees has risen sharply. Spending on star players will likely attract fans to the terraces (Baimbridge *et al.*, 1996). Unlike Baimbridge *et al.* (1996) who captures the attractiveness by number of star players in each team, this paper calculates the club net transfer spend for the respective season. This measure will capture incoming and outgoing players and be less subjective to the relative “star” appeal of a player. *Net transfer spend* is taken from various issues of the Deloitte Annual Review of Football Finance. All the monetary variables (revenue, wages, net transfer spend, and average male earnings) are in pound sterling and are deflated by gross domestic product (expenditure) at market prices deflator at constant 2008 prices.

Further, Forrest and Simmons (2002) show attendance at English football matches relate positively to the quality of the teams and to the outcome uncertainty. There are many differing ways outcome uncertainty is measured in the literature. For example, Forrest and Simmons (2002) use pre-match betting odds, and Forrest *et al.* (2005) choose to model outcome uncertainty according to current league positions, taking into account home advantage by averaging

cumulative home and points gained for the current season. Outcome uncertainty can be influenced by a team's past relative performance. In general, the most unpredictable matches will be against the teams closest in the league table. There is also a high importance of winning against the teams standing above and below in the league. Pundits have often referred to these games as gaining "six points" for a win. Also of importance is the length of time points are accumulated, either the current season (Forrest *et al.*, 2005) or the last five games (Allan and Roy, 2008). This study uses the *difference in the team's final position of last season* as an approximation for outcome uncertainty. This is to accommodate the inertia of many supporters' beliefs of where the team should be in the league table. For example, for the first month of the 2006–2007 season, Portsmouth FC remained unexpectedly at the top of the PL table following a relegation battle in the previous season. Many fans, although pleased, did not expect the team to remain in first position for long and therefore perceived games against teams close to them in the previous season to be more uncertain.

Substitute goods may include other local sporting events or teams, but football fans have high switching costs and may watch their chosen team regardless of other attractions (Feehan, 2006). To these fans, the direct substitute of watching the match live at the stadium is watching the match live on television. The strength of this substitute will depend on its price. The assumption is that as the relative price of the substitute decreases, it will attract fans away from the stadium and vice versa. The *price per game* is measured as the average price of obtaining Sky Sports or Setanta across different formats.

4.6. Exogenous Variables

The *average attendance from last season* is used to capture the substantial habit persistence of fans – those that will turn up to a match almost regardless of the team's performance (Buraimo and Simmons, 2006). The size of away-team support is approximated by the away team's average attendance in the previous season. The three newly *promoted* clubs each season are marked with a dummy variable. This will capture any spillover effects of being champions of the lower league in the previous season. Since promoted teams will have prior season attendance in the division below, *average attendance from last season* is interacted with the *promoted* dummy variable (Forrest and Simmons, 2006). Buraimo and Simmons (2006) and Forrest and Simmons (2006) show that teams with an established and longer membership to league football tend to have greater home and away fan attendance. The *age of the football club* is used to capture this effect, similar to the notion of team reputation used by Czarnitzki and Stadtmann (2002).

I add dummy variables for the day the match takes place, relative to Saturday, and if it falls on a bank holiday. Weekday games are played during the evening unless on a bank holiday, and these may naturally attract lower crowds. It is worth noting that many weekday games are often moved from Saturdays purely for the reason that they are to be broadcast live (Carmichael *et al.*, 1999).

Previous studies of attendance demand find that matches towards the end of the season attract higher attendances (Allan and Roy, 2008). However, the literature shows mixed results of the effect on attendance at matches during the opening part of the season, starting in August. Peel and Thomas (1988)

found lower attendances in all four English leagues for the first two weeks of the season. Allan (2004) and Wilson and Sim (1995) found it positive although not significant. This, however, was only one dummy variable for the “beginning of the season”, so one variable for each month of the season except for the last two months is included. April and May are combined as one variable to compensate for the relegation and champion positions being determined before the close of the season.

5. Empirical Strategy and Results

The demand for attending a live football match at the stadium will be influenced by factors such as the ticket price, prices of related goods and services (such as travel costs), prices of substitutes (such as live on TV), and income (Hammervold and Solberg, 2006). There are also a number of other influential factors, as noted by existing studies. These are detailed in the following paragraphs.

In the empirical model, the dependent variable is the natural logarithm of gate revenue. The model to be estimated is:

$$\text{LOG REVENUE}_{it} = f(\text{TV}_i, \text{GEOGRAPHICS AND DEMOGRAPHICS}_{ijk}, \\ \text{ECONOMICFACTORS}_{jk}, \text{ATTRACTIVENESS}_{ijk}, \\ \text{SUBSTITUTE}_i, \\ \text{EXOGENOUSFACTORS}_{ijk}, \text{DUMMIES}_i).$$

This is a cross-sectional time-series (panel) regression model. The variables j and k denote the home and away teams, i denotes each match, and t denotes season. Home and away teams are separated, as the attendance of travelling fans will depend on some of the away-team characteristics.

There is an argument in existing studies for considering a Tobit estimation to model the demand for attendance in the PL (Buraimo and Simmons, 2006; Forrest and Simmons, 2006; Forrest *et al.*, 2004; Welki and Zlatoper, 1999). This technique is usually appropriate when some observations of the dependent variable are censored. For example, some clubs have regular sell-out crowds at or near the stadium capacity, so attendance is censored for some observations. The dependent variable – attendance in these studies – is transformed into a percentage of the stadium capacity. However, the exact stadium capacity is difficult to obtain, as many matches require a reduction in seating to allow policing of crowds to varying degrees. Accurate capacity data could not be found that did not conflict with another source. No available source takes into account the reduced capacity for policing, and some matches even attracted crowds at more than 100% of capacity according to the data found.

In addition, many clubs employ a policy of restricting access to the most popular matches by bundling these tickets with tickets to matches of lesser interest. This means the observed attendance is higher than the actual demand for the less popular matches. As “true” demand is not observed at matches where the capacity of a stadium is not reached, this renders the Tobit method unusable, as indicated by Buraimo *et al.* (2009) and Forrest and Simmons (2002).

The model was estimated using a fixed effects method, with the assumption that the observable factors in the model contain useful information about

the club-specific unobserved effect. The club-specific effect is also referred to as unobserved, time-invariant, cross-sectional heterogeneity. If left unaccounted for, the unobserved effect will force the estimation to return inconsistent results, as it is a relevant omitted variable. The effect can be addressed directly using fixed effects estimation to account for the unique club characteristics such as *population density, unemployment, male earnings, last season's attendance, age of club, relative wage bill, and transfer spend* (Allan and Roy, 2008).

However, using the fixed effects method, any time-invariant factors such as the ones mentioned above will either vanish under the time de-meaning or time differencing approaches or be exactly collinear with the dummy variables under the panel dummy variables approach. This means the effect that time-invariant factors have on revenue will be picked up by the team. It is still feasible to estimate the marginal effect of these time-invariant regressors in a fixed effects model by interacting them with a time-varying regressor, in particular the broadcast dummy variable (Wooldridge, 2002). The interaction makes a variable that is zero when the match is not broadcast and equal to its original values when the match is broadcast.⁵ Interactive variables are therefore included in Appendix I.

Television broadcasters will wish to show the most attractive matches to gain the largest television audience possible. Attractive matches that are broadcast will therefore have two opposing effects on gate revenue. First, gate revenue will be greater for more attractive matches, as either more fans wish to watch the match or the ticket price will be higher or both. Second, the attractive match is broadcast live, reducing the gate attendance. To decompose this effect, the model is estimated once with more attractive matches and again with less attractive matches. The "top four" clubs appear in live broadcast matches between 18 and 25 times each in the 2007–2008 season,⁶ as the PL and the broadcasters believe these to be more attractive matches. For the least attractive broadcast matches, the games involving Wigan (nine matches televised during the 2007–2008 season), Birmingham (ten), Middlesbrough (ten), West Bromwich Albion (11 matches during the 2004–2005 season), and Sunderland (12) – collectively named "bottom five" clubs – will be used.

The estimation for all clubs shows that 74% of the variations in gate revenue can be explained by the variables included in the model. Some variables have been dropped due to their insignificance. Jointly, all the variables remaining are significant (F -value = 167.95). Individually, only 15 of the 28 variables are significant at the 10% or 5% level, indicated in the table by * and ** respectively. The remaining, less significant variables have not been dropped due to multicollinearity. This includes the dependent variable TV . The correlation matrix shows all the pairs of variables that are highly correlated are highlighted in red. This is mainly due to the interactive variables used to separate the club effects using TV . This high level of correlation will not only deflate the t -statistic, making the coefficient appear less significant, it will also break orthogonality assumptions of the estimation if the variables are dropped from the model. The variables remaining in the table are plausible by coefficient size sign.

To confirm the use of the fixed effects estimation, the Hausman test is used (Hausman and Taylor, 1981). A significant p -value rejects the null hypothesis that the coefficients estimated by the efficient random effects estimator are the same as the ones estimated by the consistent fixed effects estimator. This

indicated that fixed effects should be used. Forrest and Simmons (2006) note that in models of attendance demand, the scale of attendance can vary from team to team. Using the logarithm of the dependent variable often mitigates heteroskedasticity, but it can still remain. The null of homoskedasticity by means of a Lagrange Multiplier test is rejected and therefore use of robust variance covariance estimators for the standard errors to account for any unknown order of heteroskedasticity was required. In addition, the residuals can display persistence throughout a season, so a correction for serial correlation is needed. The Wooldridge (2002) panel data test for autocorrelation found no evidence of serial correlation.

Table 4 shows the coefficients, robust standard errors, and p -values for the fixed effects regressions using all clubs (1,368 observations), the “top four” clubs (288 observations), and the “bottom five” clubs (216 observations).

Using the same model across three data sets naturally performs a robustness check, this will show if the coefficients are sensitive to the data excluded. The results in Table 4 show some variation in the magnitude of the coefficients. However, all the coefficients that are significant retain the same sign, therefore economic meaning.

To aid understanding of the magnitude of the marginal effect of each variable on the gate revenue, the monetary value will be shown in parentheses as a percentage of the average gate revenue for all clubs, £1,177,528. In the following analyses, the estimation use the whole data set (all clubs).

5.1. Geographic and Demographic Variables

The *population density* local to the home team’s stadium increases gate revenue by 0.01% (£83.5) with every additional person per square kilometre when a match is televised live. This is an approximation of the potential market a football club can attract. When a match is televised live, the size of the away team potential market has little effect on the home stadium gate revenue – 0.0001% (£1.54) – and is not significant at the 10% level.

Higher travel costs, *distance*, reduces the travelling supporters and therefore reduces the home team’s gate revenue by 0.03% (£355) for every additional mile. This is much smaller than the 1.2% effect found by Forrest *et al.* (2004) but still significant at the 1% level. A non-linear relationship was not confirmed, as the coefficient for distance squared was insignificant.

An increase in the average male weekly *earnings* of residents surrounding the home stadium reduces gate revenue by 0.05% (£568) for every additional pound when a match is televised. This suggests, when a match is televised, attending football at the stadium is viewed as an inferior good, in line with findings by Baimbridge *et al.* (1996). When a match is televised live, the earnings of the residents local to the away team have a positive effect on gate revenue, 0.01% (£77). Although this is not significant, this suggests fans’ demand for away matches increases with earnings.

5.2. Economic Factors

Decreases in economic activity around the home stadium, approximated by higher *unemployment rates*, increases gate revenue by 4.3% (£50,954) for every additional unemployment benefit claimant as a proportion of resident

Table 4. The effect of live broadcasting on club gate revenue, fixed effects

LNREVENUE =	All clubs		Top 4 clubs		Bottom 5 clubs	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
TV	-0.197,2	0.32	-0.024,4	0.64	-0.214,7	0.77
(Robust s.e)	0.200,0		0.060,5		0.734,0	
HPOPDEN × TV	0.000,1	0.00	0.000,0	0.00	0.000,2	0.00
	0.000,0	**	0.000,0		0.000,1	**
AOPDEN × TV	0.000,0	0.84	0.000,0	0.32	0.000,0	0.79
	0.000,0		0.000,0		0.000,0	
Distance	-0.000,3	0.00	0.000,1	0.61	-0.001,2	0.00
	0.000,1	**	0.000,2		0.000,3	**
HEARNINGS × TV	-0.000,5	0.01	0.000,4	0.32	-0.003,3	0.00
	0.000,2	**	0.000,4		0.000,9	**
AEARNINGS × TV	0.000,1	0.74	-0.000,1	0.79	0.000,1	0.78
	0.000,2		0.000,2		0.000,4	
HUNN × TV	0.043,3	0.00	0.015,7	0.73	0.098,5	0.00
	0.008,6	**	0.045,0		0.020,6	**
AUNN × TV	-0.003,0	0.73	0.010,2	0.31	0.003,6	0.80
	0.008,7		0.010,0		0.014,5	
Derby	0.057,4	0.04	0.128,8	0.01	-0.046,0	0.38
	0.027,6	**	0.050,8	**	0.052,3	
Top 4	0.015,8	0.64	(dropped)		(dropped)	
	0.034,0					
HRELWAGE	0.350,4	0.00	0.195,1	0.00	0.162,9	0.56
	0.021,0	**	0.034,9	**	0.280,0	
HRELWAGE × TV	-0.225,6	0.00	-0.115,6	0.16	-0.259,6	0.50
	0.031,6	**	0.082,0		0.385,8	
ARELWAGE	0.092,5	0.00	0.003,5	0.97	0.062,3	0.40
	0.030,8	**	0.079,8		0.073,2	

(Continued)

Table 4. (Continued)

LNREVENUE =	All clubs		Top 4 clubs		Bottom 5 clubs	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
ARELWAGE $\times$ TV	-0.016,7 0.036,8	0.65	0.021,3 0.086,8	0.81	0.048,6 0.064,9	0.46
HTRANSFER $\times$ TV	0.000,0 0.000,0	0.26	0.000,0 0.000,0	0.41	0.000,0 0.000,0	0.06
ATRANSFER $\times$ TV	0.000,0 0.000,0	0.64	0.000,0 0.000,0	0.95	0.000,0 0.000,0	0.47
Diff in position	-0.003,8 0.001,7	0.03	-0.001,1 0.003,8	0.78	0.005,0 0.005,1	0.34
HLSATTN	0.000,0 0.000,0	0.00	0.000,0 0.000,0	0.00	0.000,0 0.000,0	0.00
HLSATTN $\times$ PROM	0.000,0 0.000,0	0.00	(dropped)		0.000,0 0.000,0	0.00
ALSATT	0.000,0 0.000,0	0.01	0.000,0 0.000,0	0.52	0.000,0 0.000,0	0.21
ALSATTN $\times$ PROM	0.000,0 0.000,0	0.29	0.000,0 0.000,0	0.67	0.000,0 0.000,0	0.25
HAGEOFCLUB $\times$ TV	0.001,9 0.001,0	0.06	0.017,7 0.002,4	0.00	-0.001,8 0.002,5	0.48
AAGEOFCLUB $\times$ TV	-0.000,9 0.001,0	0.40	-0.000,6 0.001,1	0.58	-0.006,9 0.002,7	0.01
HPROM $\times$ TV	0.084,9 0.047,0	0.07	(dropped)		0.183,7 0.058,4	0.00
APROM $\times$ TV	0.012,5 0.045,4	0.78	0.039,8 0.064,9	0.54	0.001,6 0.095,0	0.99
TV $\times$ PPG	0.004,5 0.011,0	0.69	-0.011,3 0.010,8	0.30	-0.037,0 0.022,2	0.10

WEEKDAY	-0.023,1 0.018,6	0.22	0.010,8 0.030,3	0.72	-0.022,0 0.039,4	0.58
April & May	0.048,5 0.017,9	0.01	0.022,6 0.033,2	0.50	0.095,1 0.039,6	0.02
Constant	12.517,7 0.045,1	0.00	13.705,3 0.141,8	0.00	12.389,2 0.179,8	0.00
	Observations F(27,1337) R ²	1,368 167.95 0.741,6	Observations F(24,260) R ²	288 26.98 0.454,6	Observations F(27,185) R ²	216 27.03 0.629,1

**Significant at 5% level; *significant at 10% level.

working-age population when a match is broadcast. This suggests that, holding earnings and all other things constant, a contraction in economic activity local to the home stadium may increase the time a supporter is not working and thus increases the demand for live football at the stadium when a match is broadcast live. Unemployment rates local to the visiting team's stadium have the opposite effect on the home gate revenue – a 0.3% (£3,497) reduction when a match is televised.

5.3. Match Attractiveness

As to be expected, *derby* matches that promise to display the rivalry between neighbouring teams increase match-day gate revenue by 5.7% (£67,539). Holding all other factors constant, a match involving one or more of the “top four” clubs increases gate revenue by 1.58% (£18,554). The high correlation with the clubs' wage bill is the probable cause of *top four* showing little significance.

An increase in the club *wage bill* relative to the PL average increases gate revenue by 0.35% (£412) or 0.0925% (£108) per 1% increase in the relative wage bill of the home and away teams respectively. When a match is broadcast live, a 1% increase in the relative wage bill reduces the stadium gate revenue by 0.2256% (£265) or 0.166% (£19) for the home and away clubs respectively. This is a key factor in match attractiveness. Broadcasters will seek to televise the most attractive fixtures. Of course, the net effect is still positive. The higher attraction brings a crowd to the stadium that is larger than the reduction in crowd by a live broadcast. After controlling for other match quality factors, the spending on star players, captured by the *net transfer spend*, has no effect on gate revenue when a match is broadcast.

An increase in outcome uncertainty of a match, approximated by a reduction in the *difference in league position* between the opposing teams, has a positive effect on gate revenue by 0.38% (£4,467) for each additional position. Allan and Roy (2008) use the method this paper earlier contested and finds the effect insignificant for home supporters, 0.065%.

5.4. The Direct Substitute

When a game is broadcast, the stadium gate revenue will rise by 0.45% (£5,246) for every additional pound it costs to watch a televised match live at home. This shows consumers are sensitive to the price of subscriptions allowing them to view live matches on television.

5.5. Exogenous Variables

The habit persistence of fans is captured by the *average attendance at the home stadium last season*. Gate revenue increases by 0.0024% (£28.38) and 0.0002% (£2.91) for every additional supporter the home club and away club had last season on average respectively. The effect of habit persistence is slightly weaker for the three newly promoted clubs: 0.0006% (£7.54) for the home club and 0.0001% (£1.46) for the away club.

The *age of the home club* increases gate revenue by 0.18% (£2,202) when a match is televised, similar to that found by Buraimo and Simmons (2006), 0.32%.

The age of the away club is found to have a negative but insignificant effect of 0.088% (£1,037). Buraimo and Simmons (2006) also find this insignificant.

Gate revenue is increased by 8.49% (£100,009) if the home side is one of the three newly *promoted* clubs each season when the match is televised. The effect is weaker for the away club, 1.25% (£14,736). This shows there are some spillover effects of being champions of the lower league in the previous season.

5.6. Daily and Monthly Dummy Variables

Weekday matches reduce gate revenue by 2.3% (£27,144) compared to matches played on Saturdays. Allan (2004) found these matches to decrease revenue by 7.1%. Individual day dummies are collected to make one weekday variable due to individual insignificance.

The matches played towards the end of the season, in *April and May*, increase revenue by 4.85% (£57,159). This is positive, as Allan (2004) and Wilson and Sim (1995) found. However, unlike the other studies, this is found to be significant at the 1% level. Other months were dropped due to insignificance.

5.7. The Effect of Live Broadcasting

Estimation shows that gate revenue is reduced by 19.7% (£232,237) when the match is broadcast live for all clubs. Table 5 shows the magnitude of the effect of broadcasting in existing studies. At the extremes, Allan (2004) estimates the effect to be 7.75%; Garcia and Rodriguez (2002) estimate 46%. This is not surprising to find, as my model specification includes a more extensive set of control variables than these studies.

Focussing on the “top four” clubs, the marginal effect is reduced to 2.4% and increased to 21.47% for the “bottom five” clubs. This indicates the differences in demand for matches involving the two groups of teams. The more successful teams are better able to keep gate revenue from reducing when fans

Table 5. Magnitude of the effect of broadcasting in existing studies

Effect of broadcasting	Author(s)	Data set
15.8 to 21.4%	Forrest and Simmons (2006)	1999–2000 to 2001–2002
31% to 46%	Garcia and Rodriguez (2002)	1992–1993 to 1995–1996 (La Liga)
4.8%	Buraimo <i>et al.</i> (2009)	1997–1998 to 2003–2004
Up to 31.9%	Allan and Roy (2008)	2002–2003 (Scottish Premier League)
4.1 to 17.7%	Buraimo (2008)	1993–1994
7.6%	Buraimo and Simmons (2006)	1997–1998 to 2003–2004
9.1% to 12.9%	Forrest <i>et al.</i> (2004)	1992–1993 to 1997–1998
15.6%	Baimbridge <i>et al.</i> (1996)	1993–1994
7.75%	Allan (2004)	1995–1996 (Aston Villa only)

Table 6. Payments to Premier League clubs from live broadcasting, 2007–2008 season

	Place	Live appearances	Live home matches	Payments to clubs (£m)			Total ¹	Facility fee per appearance (£)
				Share	Facility	Merit		
Arsenal	3	23	9	13.53	11.36	13.05	37.95	493,919
Aston Villa	6	17	7	13.53	8.73	10.88	33.14	513,569
Birmingham	19	10	4	13.53	5.66	1.45	20.65	566,295
Blackburn	7	14	5	13.53	7.42	10.15	31.10	529,709
Bolton	16	10	5	13.53	5.66	3.63	22.82	566,295
Chelsea	2	18	10	13.53	9.17	13.78	36.48	509,384
Derby	20	10	4	13.53	5.66	0.73	19.92	566,295
Everton	5	15	7	13.53	7.85	11.60	32.99	523,612
Fulham	17	10	7	13.53	5.66	2.90	22.10	566,295
Liverpool	4	21	10	13.53	10.48	12.33	36.34	499,222
Manchester City	9	16	12	13.53	8.29	8.70	30.53	518,276
Manchester Utd	1	25	14	13.53	12.24	14.50	40.27	489,465
Middlesbrough	13	10	3	13.53	5.66	5.80	25.00	566,295
Newcastle	12	20	11	13.53	10.05	6.53	30.11	502,270
Portsmouth	8	16	7	13.53	8.29	9.43	31.25	518,276
Reading	18	10	4	13.53	5.66	2.18	21.37	566,295
Sunderland	15	12	5	13.53	6.54	4.35	24.42	544,953
Tottenham	11	11	4	13.53	6.10	7.25	26.89	554,654
West Ham	10	11	4	13.53	6.10	7.98	27.61	554,654
Wigan	14	10	6	13.53	5.66	5.08	24.27	566,295
Total		289	138	270.69	152.26	152.26	575.21	526,861

¹Excludes payments for international broadcast rights sales. Source: Adapted from Premier League Annual Report 2008.

have an alternative to watching the game at the stadium. The average gate revenue for matches involving the “top four” clubs is £2,085,834. On average, these clubs can expect a £50,060 (2.4%) reduction when the match is broadcast live. Similarly, the “bottom five” clubs’ revenue averages at £791,052. These clubs can expect, on average, a £169,839 (21.47%) reduction, all other things being equal.

From Table 6, payments to each club are on average £4.12m per game broadcast (2007–2008 season). This figure includes the equal share allocated to each club by the PL and the merit payments awarded for final league position, as well as a facility fee. These figures are shown in Table 6 as a breakdown of payments by club for 2007–2008. Facility fees are based on how many appearances the team makes on live television. This part of the payments is the only part to vary with the amount of games broadcast.

The average facility fee for games broadcast in the 2007–2008 season is £497,998 for the “top four” clubs and £551,101 for the “bottom five” clubs. Taking into account the estimated average loss of gate revenue from fans watching a game on the television instead of at the stadium, the “top four” clubs are set to gain £447,938 and the “bottom five” clubs £381,262 every time the team appears in a live televised game.

6. Conclusion

This paper analyses the main argument for collective selling behaviour put forward by the PL. The results showed that the effect of live broadcasting on match-day gate revenue is negative and, more importantly, not the same for every club in the PL. Using the most recent data to include the 2007 government intervention, evidence shows that the effect of broadcasting is small for the “top four” clubs and much larger for the worst performing “bottom five” clubs. However, the broadcast facility fees still outweigh the loss of gate revenue. In other words, marginal revenue is greater than marginal cost. The price, in theory, will fall as quantity increases, but relaxing the quantity constraint on broadcast matches towards the point that marginal cost and revenue are equal should increase profit. This is to say, the fans, the broadcasters, and the clubs involved in the market may well be made better off by an increase in PL matches shown live on TV.

Notes

1. Factors such as a team’s allocation or uncertainty of the match outcome are researched by Buraimo *et al.* (2009), Dobson *et al.* (2001), Forrest *et al.* (2004), Noll (1974), amongst others.
2. In a study of the Spanish football league, Garcia and Rodriguez (2002) find evidence of a significant reduction in stadium attendance when a match is televised. The effect is increased for matches shown on free-to-view terrestrial television.
3. By Carmichael *et al.* (1999), Forrest and Simmons (2002), and Forrest *et al.* (2004).
4. Of Neale (1964), Rottenberg (1956), and Sloane (1971).
5. To allow for a more flexible functional form, this paper uses the interaction of the TV variable with time-varying regressors. This is particularly valuable in a fixed effects model, as unchanging variables will be otherwise washed out by time de-meaning. This method does change the interpretation of the coefficients. It would now represent the marginal effect of the time-invariant regressor evaluated when the match is broadcast.
6. Number of broadcast matches 2007–2008 season: Manchester United, 25; Arsenal, 23; Liverpool, 21; Chelsea 18.

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Appendix I

Population density:

The 2004- and 2006-based sub-national population projections are taken from the UK National Statistics online.

Distance:

The measured road distance between grounds of home and away team is taken from Automobile Association figures.

Earnings:

Taken from the Annual Survey of Hours and Earnings, Office for National Statistics (ASHE) mid-year estimates for respective years.

Unemployment rates:

Claimant count rates are taken from NOMIS for the respective years.

GDP deflator:

The GDP deflator (YBGB) is taken from the United Kingdom Economic Accounts.

Price per game:

Setanta Sports is available on digital satellite for £12.99 per month or on Virgin Media for £41 per month. Sky Sports is available on as a Sky sports mix package for £35.50 per month or on Virgin Media for £41 per month. The average monthly subscription is taken over the ten months of the season and divided by the number of games available, 92 for Sky and 46 for Setanta.

Interactive variables:

population density $\times$ TV, *unemployment* $\times$ TV, *male earnings* $\times$ TV, *last season's attendance* $\times$ TV, *age of club* $\times$ TV, *relative wage bill* $\times$ TV, *transfer spend* $\times$ TV, and *price per game* $\times$ TV. The two time-invariant match popularity measures – *relative wage bill* and *transfer spend* – will be included in their original form in addition to the interactive variable.