Original Article

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Why Are Inferior Seats "Underpriced"? Evidence from the English Premier League

Abstract: This paper studies the practice of loss-leader pricing strategy in the English Premier League (EPL). While the TV broadcasting revenue for EPL clubs has increased over the past 20 years, the importance of revenue from ticket sales has declined. The theory of multi-product pricing suggests that a change in the relative importance of revenue sources can induce profit-maximizing firms to underprice one product in order to raise the demand for a complementary one. Using other leagues in England and Scotland that do not have as much TV broadcasting revenue as a control group, we find that inferior seats are underpriced among the EPL clubs. Consistent with the growing importance of TV broadcast revenue, we also find that such "loss-leader pricing" is stronger in later years of the sample. Furthermore, we provide evidence that the underpricing of inferior seats is more pronounced in (i) EPL clubs compared to clubs in other European leagues; (ii) elite clubs in EPL compared to non-elite clubs in EPL that have less TV broadcasting revenue; and (iii) clubs promoted to EPL as compared to clubs that are either promoted or relegated to different leagues in England and Scotland. These findings corroborate with the hypothesis that clubs that rely more on TV broadcasting underprice their inferior seats as loss leader to attract more passionate fans.

Keywords: loss-leader pricing, English Premier League, cross-subsidization
JEL codes: D22, L11, L83

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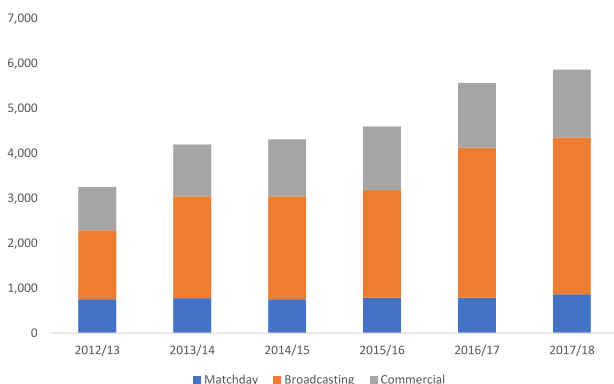Kwok Ping Tsang: Virginia Tech, Blacksburg, VA, USA, E-mail: byront@vt.edu
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"For every pound that you lower the ticket price, if you can recover it in that home advantage, you maybe won't have a loss." Vincent Kompany (Captain of Manchester City) 2018

1 Introduction

Nowadays, the business model of most major sports leagues relies on multiple sources of revenue. While ticket sales still generate significant revenue for these leagues, TV broadcasting fee often is a major source of their total revenue. The English Premier League (EPL) is a prime example of such business model. Figure 1 shows that between the 2012/13 and 2017/18 seasons, season/matchday ticket's contribution to total revenue has dropped from 23 to 15%, while TV broadcasting as a proportion of total revenue for the English Premier League has increased from 47 to 60%.

These two sources of revenue are interrelated. Clubs might have an incentive to decrease the price of one source (tickets) as a "loss-leader", and profit through the higher income from another source (TV broadcast).[1] Besides, loss-leader pricing, the underpricing of tickets also has another interpretation: to the extent that home field advantage (i.e. a club has a higher winning percentage at home games compared to away games) is important and TV broadcast revenue distribution is merit-based (i.e. clubs with a higher position in the league table would get a bigger share of TV broadcast revenue), a club can sacrifice part of its revenue from ticket sales (lower ticket price to attract vocal and passionate fans) as "input"

Source: Deloitte

Figure 1: Revenue of the premier league by sources 2012–2018.

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1 We use a broad definition of "loss-leader pricing" here, because we do not have direct evidence that teams charge their tickets below marginal costs.

to create stronger home advantage, which in turn translates into better performances on the field, and therefore more prize money from TV broadcast revenue, as "output".[2] Both interpretations are "operational": when TV broadcast revenue becomes more important, there are stronger incentives to underprice tickets to attract more vocal and passionate fans to the stadium either because i) a full and lively stadium looks "nice" on TV (first interpretation); or ii) they can motivate the players to perform better (second interpretation). There are, however, subtle differences between the two interpretations. For instance, if a home team wants to use the vocal and passionate fans as an input to motivate players, the fans would be put in a section of the stadium where their voices could be heard or where their flags could be seen. On the other hand, if a home team wants to underprice tickets purely for loss leader reason, the fans would be put in a section observed the most by TV audiences. Unfortunately, we do not have enough data to distinguish the two interpretations. For the fluidity of the presentation, we will focus on the loss-leader pricing hypothesis for the remainder of the paper.

While clubs in general have incentive to engage in "loss-leader pricing", the marginal gain for this pricing strategy vary across clubs for various reasons. First, clubs with stadiums that have better acoustic effects can be more effective in turning passionate and vocal fans into better atmosphere.[3] Second, clubs with a larger pool of passionate (usually working class) fans traditionally have a lower marginal cost in luring these fans to attend games.[4] Third, clubs with a higher proportion of revenue from TV broadcasting have a higher marginal return in boosting home advantage.

In this paper, we test the above hypotheses in English soccer leagues. We first collect price data for various types of tickets and complementary products of clubs in the EPL and other English, Scottish and European leagues from the BBC *Price of Football Surveys* between 2012/13 and 2017/18. While we do not have direct measures for stadiums acoustic effects and clubs' pool of passionate fans, we construct a measure of traditional home advantage as a proxy, using their home and away game outcomes in their corresponding leagues between 2004/05 and 2007/08. We also use other non-EPL English and Scottish leagues, which do not see as much of a rise in TV broadcasting revenue, as control groups in our empirical analysis.

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2 This logic is similar to the one in Cheung (1977), in which he argues that better seats are underpriced because those who bought the better seat tickets are also inputs that help monitor seat jumping.

3 Fan Chants, a website that allows people to upload their favorite songs or chants, found that the decibels level varied greatly among the EPL stadiums in 2011, with Liverpool having the loudest stadium (97 dB) and Fulham having the quietest stadium (65 dB). See https://worldsoccertalk.com/2011/05/13/top-20-loudest-football-grounds-in-premier-league/.

4 For instance, Chelsea F.C., an EPL club whose stadium is located near the wealthier region of West London, have more middle-class supporters than clubs with more working-class support such as Liverpool F.C. and Newcastle United.

We find strong supporting evidence that is consistent with "loss-leader pricing" in the EPL, i.e. clubs with stronger traditional home advantage tend to charge lower price for their cheapest matchday tickets (usually assigned in the inferior seats in stadiums). The evidence is both statistically and economically significant. In our baseline specification, a one standard deviation increase in home advantage for a club in the EPL is associated with an additional £3 drop in its cheapest matchday ticket (approximately 10% of the average cheapest matchday ticket in the league), compared to clubs in other English and Scottish leagues.[5] The evidence for loss-leader pricing is stronger if we restrict the sample to the most recent three seasons, corroborating with the fact that TV broadcast revenue has been increasing over the years.

However, we do not find strong supporting evidence of "loss-leader pricing" in the EPL for their season tickets and the most expensive matchday tickets. We speculate that this non-results can be explained by (i) season ticket sales revenue still compose a significant share of overall ticket sales revenue, and (ii) the most expensive matchday tickets are usually targeted at middle class fans who do not contribute much to the overall stadium atmosphere.

In other robustness tests, we also find more corroborating evidence for "loss-leader pricing". In particular, we find that (i) EPL clubs engage more in "loss-leader pricing" compared to clubs in other European leagues, with the former's TV broadcast revenue much higher than the latter; (ii) elite clubs in EPL, which have higher TV broadcast revenue than other non-elite clubs in EPL due to the former's higher chance in participating in European competitions, engage more in "loss-leader pricing"; and (iii) clubs promoted to EPL adjust the ticket price more in line with "loss-leader pricing", as compared to clubs that are either promoted or relegated to different leagues in England and Scotland.

The paper is organized as follows. We review the literature in Section 2. Section 3 discusses the institutional features of the English Premier League. Section 4 describes our data. We discuss our empirical strategy and results in Sections 5 and 6. Section 7 concludes.

2 Related Literature

This paper is related to the economics of ticket pricing. Courty (2000) reviews the literature and categorizes it into several themes. While a big part of the literature focuses on the second-degree price discrimination,[6] this paper fits into the theme

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5 To give reader a sense of the variation of home advantages, Liverpool F.C.'s home advantage is approximately 2 standard deviation higher than that of Manchester United.

6 See Leslie (2004) and McManus (2007) for two such empirical applications.

of pricing complementary goods. Lott and Roberts (1991) and Landsburg (1993) explain why the price of popcorns is "high" at movie theaters. Steiner (1997) discusses the complementarity between free admission and restaurant sales for museums. Rosen and Rosenfield (1997) provide a theory to explain how the pricing of complementary goods can affect the seller's incentives to practice second-degree price discrimination.

This paper is also related to the loss-leader pricing literature. Hess and Gerstner (1987) use a two-period model to show that stores could increase profit by pricing the shopping good below its marginal cost to attract consumers into the store, and then profit through the impulse goods. Lal and Matutes (1994) show that loss-leader pricing can economize on advertising by only advertising on the goods that is priced below marginal cost. DeGraba (2006) hypothesizes that turkeys are being used as loss leaders before Thanksgiving not because most customers purchase a Turkey before Thanksgiving, but because those customers are more profitable than those who do not. Li, Gu, and Liu (2013) find that online book retailers with high cross-selling capabilities reduce prices on best sellers more aggressively.

There are several papers that discuss the pricing strategies that exploit the complementarities between related markets in the entertainment industries. Krueger (2005) proposes several hypotheses to explain the surge in music concert ticket prices. He finds that the "Bowie Theory" (i.e. the erosion of complementarities between concerts and album sales) is the most plausible explanation. Mortimer, Nosko, and Sorensen (2012) also find evidence that file-sharing has impacted the complementarities between album sales and music concerts. They find that while file-sharing reduced album sales, it simultaneously increased demand for music concerts. Leung (2015) uses a conjoint-survey approach to quantify the complementarities between music piracy and iPod. He then finds that an iPod tax that exploits such complementarities could be welfare-improving under certain assumptions. Kim and Leung (2017) use a conjoint-survey approach to quantify the complementarities between e-book and e-book reader. They find that the change in consumer welfare when Digital Rights Management is removed is sensitive to the supply-side response.

Studies have shown that many sporting events' prices are set at inelastic region of the demand. Bird (1982) and Garcia and Rodriguez (2002) find that the price elasticity of tickets in English soccer and Spanish soccer are −0.2 and −0.3 to −0.9, respectively. Fort (2004), based on the argument of Fort and Quirk (1995), argue that the inelastic pricing in Major League Baseball can result from a particular relationship between local TV broadcast revenues. Krautmann and Berri (2007) show that owners could price tickets in the inelastic region of demand to sell more concessions. Our paper offers another explanation for some clubs (with higher home advantage) to offer discounts in their matchday tickets.
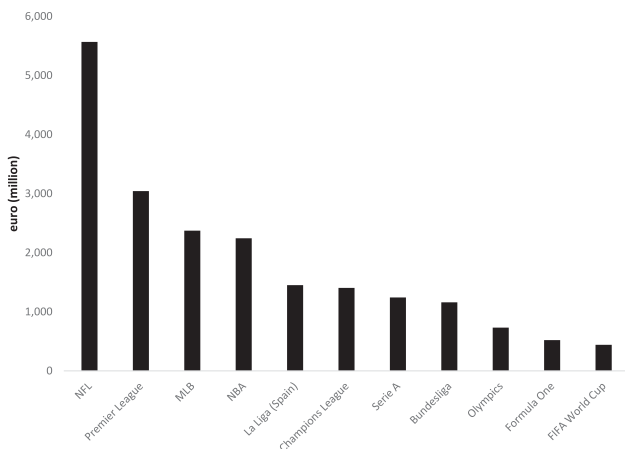
3 The English Premier League: TV Broadcasting Fees, Home Advantage, and Ticket Pricing

3.1 The Distribution of TV Broadcasting Fees and Other Incentives to Perform in EPL

The EPL is the second most popular sports league in the world, using broadcast rights fees as a measure (Figure 2). The league is not just popular in UK or Europe, but also in the rest of the world. Among the £5,136 million TV broadcast revenue the league obtained for the seasons between 2016 and 2019, 16% of that comes from America, 34% of that comes from Asia-Pacific, and 19% of that comes from the Middle East.

As mentioned in the introduction, the importance of TV broadcast revenue has increased over the years. Figure 1 shows that between the seasons 2012/13 and 2017/18, matchday ticket's contribution to total revenue has dropped from 23 to 15%, while TV broadcasting as a proportion of total revenue for the English Premier League has increased from 47 to 60%.

As of now, all international broadcast revenue is split equally among the 20 clubs in the league. However, 25% of UK broadcast revenue is paid in Merit Payments ("Prize Money" per place in the league table).[7] The difference in

Source: Oliver & Ohlbaum

Figure 2: TV broadcasting fees in 2016.

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[7] There has been discussion to change the distribution of the international broadcast revenue to a more merit based system. See https://www.standard.co.uk/sport/football/premier-league-clubs-refuse-to-back-big-six-plan-for-bigger-share-of-tv-cash-a3650791.html.

Merit Payment is significant. For instance, one place up in the league table translated into an additional £0.76 million in Merit Payment in the 2012/13 season. The corresponding number increased almost three times to approximately £2 million in the 2016/17 season. The difference in Merit Payments for the first and the last placed EPL club in the 2016/17 season is close to £40 million.

The Merit Payments only represent part of the incentives for a club to perform in the EPL. There are at least two other unique features of the European soccer leagues that are different from the major US sports leagues which provide EPL clubs extra incentives to perform well in the league. The first is the opportunity to participate in European competitions. As of now, there are two major European soccer competitions: The UEFA Champions League and the Europa League, both of which provide significant income to participants.[8] In the seasons covered in our sample, the top four clubs in the EPL league table would be eligible to play in the UEFA Champions League, while the 5th and/or the 6th clubs would be eligible to play in the Europa League.[9]

The second unique feature is the promotion/relegation system in European soccer. As of now, there are eight levels of soccer leagues in England, with the top four levels (the EPL, The Championship, League One, and League Two) being fully professional. Unlike the major sports league in the US, clubs are not locked in one level permanently. In each season, there are three/four teams in each league that would be relegated/promoted to the level below/above. For instance, the last three clubs in the EPL league table would be relegated to the English Championship, which would lead to a significant drop of TV broadcast revenue for the club.[10]

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8 For instance, in the UEFA Champions League 2016–17, a club would be guaranteed to receive €12.7 million just to participate in the group stages. The performance bonus is significant as well. Clubs can receive €1.5 and €0.5 million per win and per draw in group stages, respectively. The bonus of reaching the round of 16, quarter finals, semifinals, and final are €6 million, €6.5 million, €7.5 million, and €15.5 million, respectively.

9 The top three clubs would qualify directly in the group stages in the Champions League, while the 4th club in the league would have to play in a qualifying round before getting into the group stage. As for the Europa League qualification, if the FA Cup winner is one of the top five clubs which is already eligible to play in next season's European competition, then the 6th club in the league would be eligible to play in the Europa League in the next season.

10 According to Deloitte's *Annual Review of Football Finance*, the revenue of the English Championship (in which there were 24 clubs) was £556 million in 2015/16, while the corresponding number in the EPL (with 20 clubs) was £4,460 million, with £2,700 million (60%) coming from TV broadcasting revenue.

3.2 Home Advantage

The importance of home advantage has been well documented in the sports literature. For instance, Clarke and Norman (1995) use the results in English Football League from 1981/82–1990/91 and find that home advantage is approximately worth 0.5 goal on average. Among the various factors that might contribute to home advantage, Agnew and Carron (1994) and Nevill, Newell, and Gale (1996) find that crowd effects is one of the most significant. While crowd effects are closely associated with stadiums' atmosphere, this might explain why rankings on stadiums' atmosphere have been regularly conducted and published.[11,12]

However, the increasing popularity of the EPL has led to a significant increase in ticket prices for EPL games. This has led to concerns of a change in the fans's demographics, and therefore a deterioration in atmosphere.[13] Jose Mourinho, then the head coach of Chelsea, complained after a home draw with West Bromwich Albion in 2013: "We know Stamford Bridge [Chelsea's home stadium] is not a very hot atmosphere, not a very strong atmosphere normally, and we accept that". Tim Rolls, chair of the Chelsea Supporters Trust, said in an interview that the change in demographics was, at least, partly to blame: "The atmosphere is still good at away matches. But at home, it's partly the demographic changes. Also, there are more tourists, it's an experience and they're there to capture it on their iPad rather than interact. Also, people have got older… around me, there's so many people over 45. With the best will in the world, you're not going to get as much noise out of them."

There are calls for measures to enhance the atmosphere in stadiums. Richard Scudamore, the Premier League chief executive, said in 2013 that fans were an integral part of the "show" being sold around the world. "We can't be clearer. Unless the show is a good show, with the best talent and played in decent stadiums with full crowds, then it isn't a show you can sell."

EPL clubs have started to address the issue. First, the EPL clubs' stadium occupancy rates have been close to 100% in recent seasons with long waiting lines for season tickets for many clubs, which suggests that EPL clubs might have

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11 This is one such example: https://www.express.co.uk/sport/football/894644/Premier-League-teams-atmosphere-worst-best-sportgalleries.

12 We use the head-to-head results of league games in England and Scotland between 2012/13 and 2017/18 seasons and show that higher attendance ratio in stadium is positive associated with the probability of home wins, even after controlling for the strength of home and away teams. The results are in the Appendix.

13 A survey by the EPL in 2013 has shown that the average age of a EPL season-ticket holder was 44, and that only around 9% can be classified as working class. The same figure used to be around 75–80%.

underpriced their tickets compared to clubs in other leagues.[14] Second, starting in the 2016/17 season, the league put a cap on away tickets at £30, with the support of most clubs, to encourage younger fans to attend away games.

In addition to imposing a £30-cap on away tickets since 2016/17 season, clubs (in particular clubs which traditionally have more home advantage) have indeed attempted to create a better atmosphere within the stadium. For instance, Newcastle United, a club renowned for its home atmosphere (and have the highest home advantage in the EPL in our constructed measure), introduced a "singing" or "noisy" corner in St James' Park, its home stadium, in which vocal fans will be encouraged to lead the renditions of the Blaydon Races in exchange for reduced ticket prices. Liverpool, another club with home advantage tradition (and have the fourth highest home advantage in our constructed measure), cut the price for the cheapest matchday ticket from £37 to £9 in the 2016/17 season to local fans (people living in the L postcode).

3.3 Ticket Pricing

As in other live performances such as opera and music concerts, soccer teams divide their stadiums into zones according to the view quality and charge different prices accordingly. In the EPL, for instance, the most expensive matchday ticket in an EPL game can be more than double of the cheapest matchday ticket. Many EPL clubs also offer hospitality package in a game. The package generally includes some combination of matchday ticket with a seat in a suite/box, food, beverages, hotel and stadium tour, which can cost up to £500 at bigger clubs.

Because of the huge demand for attending EPL games, match tickets are difficult to come by. There are several ways to attend an EPL game. First, season ticket holders are guaranteed to attend all the home league games of the team in the season, and would have priority in purchasing tickets in cup games. Approximately 73% of EPL tickets are sold to season ticket holders in recent seasons.[15] However, many EPL clubs have long waiting lists for season tickets. For instance, the waiting list for a season ticket at Arsenal Football Club is 45,000.[16] Second, a member of the teams' fan club (at an annual cost of between £35 and £50) has priority, after season ticket holders, to purchase matchday tickets at the club's website. Note different

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14 Using the information on stadium capacity we collected and the average attendance of different leagues collected from the Football League, we calculate that the stadium occupancy rates in EPL, English Championship, League One, and League Two are 95, 65, 45, and 43%, respectively in the seasons since 2010/11.

15 The corresponding percentages in lower leagues in England are between 50 and 60%.

16 See https://ticket-compare.com/season-ticket-premier-league-team-worth/.

members have different priority in purchasing tickets. For instance, members who have purchased matchday tickets previously would have more credit in purchasing tickets in the future. Third, if a game is not sold out after the season ticket holders and fan club members have purchased their tickets, the club will sell the remaining tickets to open public through the club's website.

There is also a second-hand market for matchday tickets. Potentially the loss-leader strategy could be upset by scalping. Indeed, there are various scalper websites for EPL tickets. While the EPL has warned that tickets sold by scalper can be void, there are some "legitimate" unauthorized ticket websites for second hand tickets, including StubHub and Viagogo, which have official relationships with some of the clubs. However, a significant portion of the buyers in the second-hand market are tourists. The "Shipping the Good Apple Out" logic suggests these tourists would be more willing to pay for the better seats or even the hospitality packages. Indeed, a simple search on StubHub and Viagogo suggest that most available tickets are for seats in better zones or in suites/boxes.

Also, while most clubs do not have an explicit policy to prevent resale of tickets, clubs have various ways to increase the chance of the tickets falling into the hand of truly passionate fans, especially tickets in the cheapest categories. First, as mentioned above, club members, who usually have followed the club and paid membership fees for years, have priority in purchasing matchday tickets. Second, some clubs require identity check of buyers of the cheapest matchday tickets. For instance, Liverpool F.C. requires photographic ID and proof of 'L' postcode residential address from buyers of the 'L' postcode tickets that cost £9.

4 Data

4.1 BBC Price of Football Data

Our ticket price data comes from the annual BBC *Price of Football Surveys*. BBC has been reporting the prices of matchday tickets (the cheapest and the most expensive), season tickets (the cheapest and the most expensive), away tickets, and various products sold inside a football stadium since 2011. In the 2017 survey, for instance, BBC contacted 232 clubs for the study. Of those, 202 were in England, Scotland, Wales and Northern Ireland, with a further 30 in Europe. The data was collated and verified by BBC Sport journalists. In this paper, we use the price data of clubs from the five top leagues in England (Premier League, Championship, League One, League Two, and National League), the top four leagues in Scotland (Premier League, Championship, League One, and League Two), and other European leagues.

As Table 1 shows, the ticket prices are the highest in the EPL, followed by the English Championship and then the Scottish Premier League. The gap between the

Table 1: Average prices of tickets across leagues (in GBP).

	ECL	EPL	League 1	League 2	NL	SCL	SLeague 1	SLeague 2	SPL	Total
Season (Low)	334.1	482.2	287.6	271.4	252.1	251.5	189.7	162.0	301.7	302.4
	(79.59)	(188.4)	(54.02)	(38.10)	(41.18)	(37.03)	(21.91)	(13.90)	(48.50)	(121.4)
Season (High)	581.9	862.8	409.0	387.8	354.9	316	205.7	183.0	411.6	463.3
	(132.0)	(401.7)	(69.35)	(56.59)	(46.17)	(79.21)	(27.38)	(44.15)	(110.7)	(259.7)
MatchDay (Low)	21.20	29.64	19.77	18.42	16.03	18.38	13.81	12.24	21.26	20.03
	(4.603)	(8.229)	(2.867)	(2.174)	(1.696)	(2.039)	(1.520)	(0.663)	(1.879)	(6.190)
MatchDay (High)	36.29	55.11	25.41	23.02	19.03	20.92	14	12.76	29.53	29.10
	(5.888)	(18.22)	(3.130)	(2.147)	(2.625)	(4.032)	(1.519)	(1.268)	(8.241)	(14.89)
Away (Low)	22.35	28.86	20.33	18.84	16.42	18.46	13.78	12.04	22.23	20.38
	(5.253)	(5.590)	(2.935)	(2.738)	(2.398)	(2.064)	(1.553)	(1.060)	(1.977)	(5.803)
Away (High)	31.21	35.02	23.53	21.75	18.03	19.58	13.93	12.64	28.73	24.57
	(5.075)	(10.97)	(2.626)	(2.149)	(1.808)	(2.903)	(1.439)	(0.700)	(8.337)	(8.801)

Source: BBC price of football surveys 2012–2017.

ticket price level between the EPL and the English Championship is significant. The prices for season and matchday tickets (both the cheapest and the most expensive categories) in the EPL are approximately 40% higher than that in the English Championship. The price differences between the lower leagues are less significant.

In addition to ticket prices, we also consider prices complementary products in our analysis. of Table 2 shows that the prices of complementary products in the English Premier League are the most expensive among all the English and Scottish leagues, though the difference are not as significant as in the ticket prices.

4.2 Traditional Home Advantage Data

As we argue in the introduction, clubs with stadiums that have better acoustic effects or with a huge traditional fan base would be more inclined to practice "loss-leader pricing". Presumably, these clubs would have strong home advantage even in an era when TV broadcasting revenue was not as high. We construct a measure of home advantage of clubs in the past as a proxy for these characteristics. By definition, a club has a home advantage when it performs better at home games than at away games. A natural way to construct a measure for a club's home advantage is to compare the results at home and away. To construct our measure of traditional home advantage for each club, we collect information on each club's home and away results (number of points in the league that the club competes in) from www. sportstats.com approximately 10 seasons before our ticket price sample, between the seasons 2004/05 and 2007/08. In those past seasons, the gap between EPL and other leagues in terms of TV broadcasting revenue was not as huge as today. Also, approximately half of the EPL clubs then are now playing in lower leagues.

Unlike many of the American sports leagues, clubs in most European soccer leagues play each other twice (home and away) in each season. The more balanced nature of the European soccer leagues makes it easier to estimate home advantages of clubs. In our main specifications, we construct the home advantage of a club i in season t by using the difference in points obtained from home games versus away games, normalized by the club's overall points obtained in the season:[17]

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[17] We also tried using a couple seasons before and after 2004/05–2007/08. Results are similar. Also, in another specification, we use the head-to-head results to account for team i ability in measuring the team's home advantage as in Clarke and Norman (1995). In particular, we estimate the winning margin w_{ij} in a match between club i and club j played at club i's home stadium as $w_{ij} = u_i - u_j + \text{Home}_i + \varepsilon_{ij}$. We do not have historical head-to-head results in the lower leagues in Scotland and many of the European leagues. The results using the English leagues are qualitatively similar to those in our main specifications. Interested readers can contact us for those results.

Table 2: Average prices of complements across leagues (in GBP).

	ECL	EPL	League 1	League 2	NL	SCL	SLeague 1	SLeague 2	SPL	Total
Programme	3.076	3.388	2.984	2.960	2.932	2.500	2.048	2.152	2.966	2.924
	(0.232)	(0.266)	(0.125)	(0.227)	(0.173)	(0.655)	(0.568)	(0.573)	(0.376)	(0.477)
Pie	3.337	3.502	3.122	2.958	2.919	1.955	1.700	1.957	2.172	2.890
	(0.403)	(0.433)	(0.460)	(0.367)	(0.445)	(0.274)	(0.297)	(0.391)	(0.212)	(0.687)
Tea	2.087	2.093	1.894	1.682	1.549	1.750	1.193	1.276	2	1.818
	(0.214)	(0.377)	(0.355)	(0.367)	(0.344)	(0.430)	(0.359)	(0.370)	(0.340)	(0.438)
Adult shirt	45.26	49.91	42.18	40.91	40.40	43.00	39.81	38.74	45.52	43.50
	(3.136)	(5.338)	(2.597)	(1.946)	(2.837)	(3.754)	(3.642)	(3.804)	(4.829)	(4.882)
Junior shirt	34.80	39.24	32.24	32.03	33.13	34.34	31.90	30.69	35.90	34.09
	(4.041)	(5.251)	(3.709)	(2.759)	(3.216)	(3.045)	(3.846)	(4.169)	(3.766)	(4.619)

Source: BBC price of football surveys 2012–2017.

Table 3: Average home advantage across leagues.

ECL	0.206 (0.0898)
EPL	0.191 (0.0798)
League 1	0.183 (0.0970)
League 2	0.174 (0.0932)
NL	0.180 (0.0945)
SCL	0.148 (0.0937)
SLeague 1	0.127 (0.0775)
SLeague 2	0.135 (0.0732)
SPL	0.141 (0.0763)
Total	0.175 (0.0912)

Source: www.sportstats.com.

$$\text{Home}_{it} = \frac{\text{home points}_{it} - \text{away points}_{it}}{(\text{home points}_{it} + \text{away points}_{it})/2}.$$

We then average the home advantage of each club over the four seasons to construct our measure of traditional home advantage:

$$\text{Home}_i = \frac{\sum_{t=2004}^{2007} \text{Home}_{it}}{4}.$$

Table 3 reports the average home advantage of clubs in the nine leagues in England and Scotland. Home advantage is more important in England than in Scotland. However, there are not significant differences in traditional home advantage between leagues inside England or inside Scotland.

A scatter plot between traditional home advantages and prices of the cheapest matchday ticket provide preliminary evidence on "loss-leader pricing" of EPL clubs. The upper panel of Figure 3 shows that traditional home advantages and the prices of the cheapest matchday ticket have a negative correlation among EPL clubs, while we do not see significant correlation between the two variables among non-EPL clubs (lower panel of Figure 3). However, we do not see the same pattern between the prices of categories of tickets and traditional home advantages. For instance, Figure 4 shows that the prices and the cheapest season tickets are positively correlated in both the EPL and in other leagues.

We also collect other club specific variables, such as the capacity of the stadium and the town/city that the clubs locates, from the individual clubs' websites.
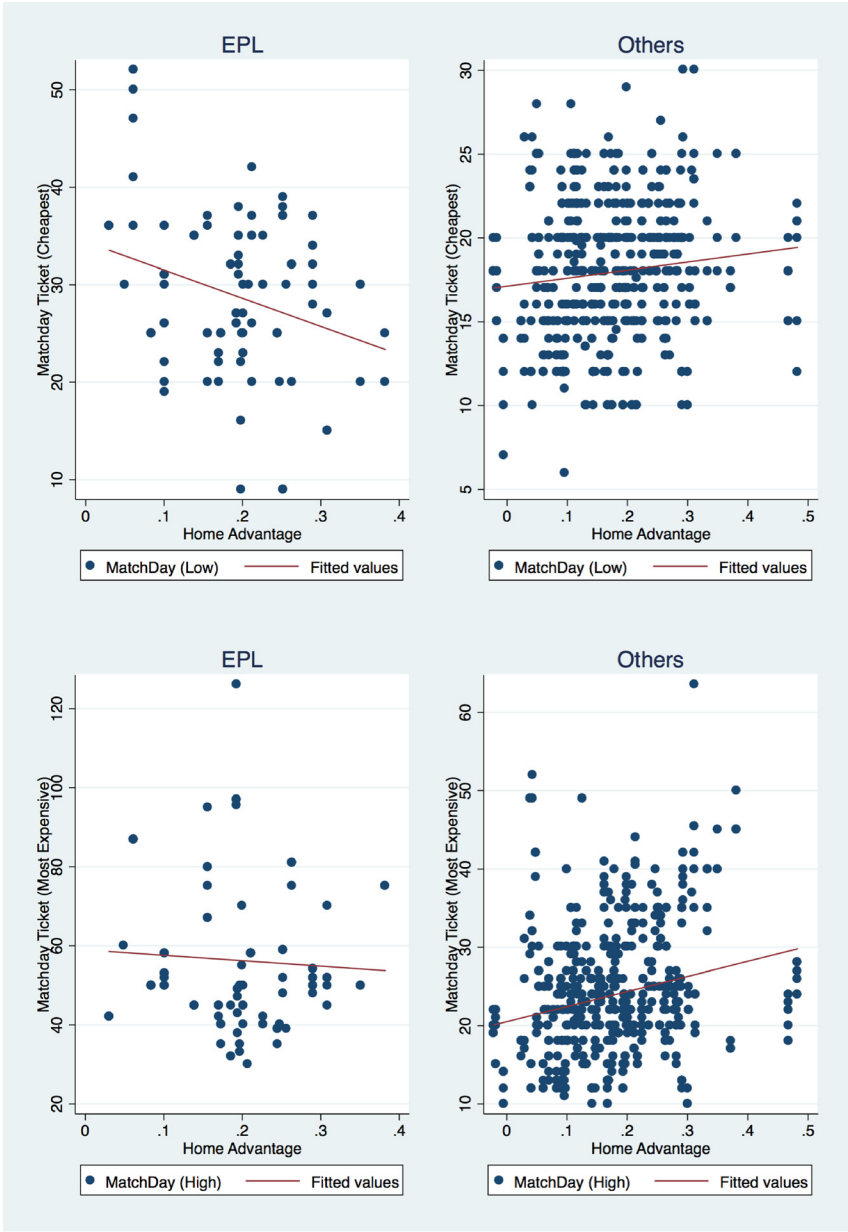
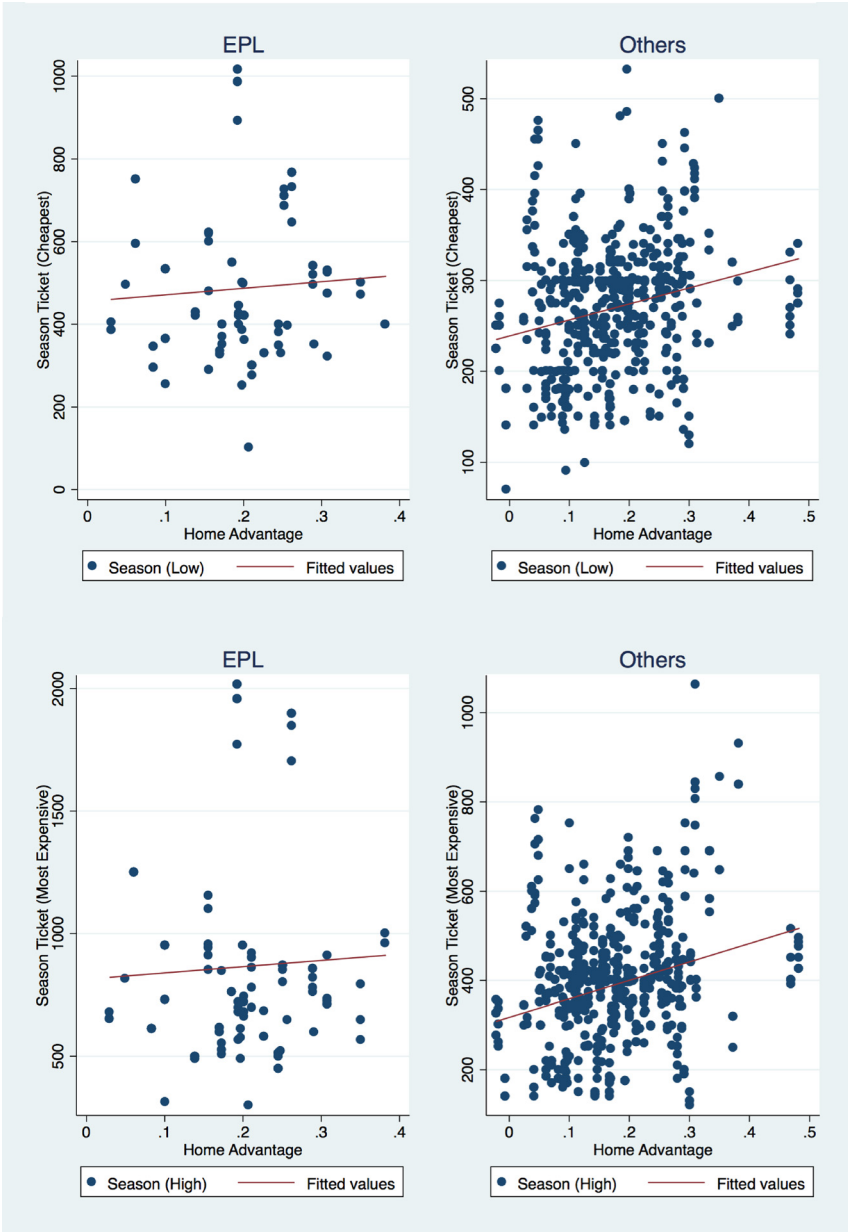**Figure 3:** Home advantage and matchday ticket price (EPL vs. Non-EPL).

Figure 4: Home advantage and season ticket price (EPL vs. Non-EPL).

5 Empirical Model

5.1 Main Specification

We hypothesize that clubs with more home advantage have a higher marginal benefit to adopt loss-leader pricing strategy, i.e. reduce ticket price to enhance results and therefore TV broadcasting revenue. Our hypothesis implies a negative correlation between ticket price and traditional home advantage. This negative correlation would be more profound in the EPL because the higher TV broadcast revenue increases the marginal benefit of such loss-leader pricing. To test this hypothesis, we run an OLS on the following specification:

$$Y_{it} = \beta_0 + \beta_1 \text{EPL}_{it} + \beta_2 \text{Home}_i + \beta_3 \text{EPL}_{it} \times \text{Home}_i + \beta_4 X_i + \lambda_t + \varepsilon_{it},$$

where Y_{it} is the price of either tickets or complementary products sold by club i in season t. The types of ticket we consider here include season ticket, matchday ticket, and away ticket (both the cheapest and the most expensive categories). The types of complementary products include matchday programme, pie, tea, and adult and child shirt. EPL_{it} is a dummy variable that equals to one if club i competes the EPL in season t. Home_i is our constructed measure of traditional home advantage for club i. X_i is a set of club level controls for club i, including stadium capacity and town/city fixed effects. λ_t is season fixed effects.

Our variable of interest is $\text{EPL}_{it} \times \text{Home}_i$, which captures the differential impact of traditional home advantage on Y_{it} between the EPL and the leagues in the control group. We expect β_3 to be negative if EPL clubs with more traditional home advantage are more likely to adopt loss-leader pricing strategy.

In our main specification, we use the eight other leagues in England and Scotland (English Championship, English League One, English League Two, English National League, Scottish Premier League, Scottish Championship, Scottish League One, and Scottish League Two) as the control group. Because the home advantage effect seems to be different in Scotland, we also drop the Scotland sample to compare the EPL and other English leagues as a robustness check.

5.2 Robustness Checks

The divergence of TV broadcast revenue also occurs between the EPL and other leagues in Europe. As another robustness check, we also compare the EPL and other European clubs covered in the BBC *Price of Football Surveys*. In that specification, we also construct the traditional home advantage measures for the

European clubs using their home and away results between the seasons 2004/05 and 2007/08. We construct other club-specific variables, such as stadium capacity, the same way as before. The regression specification is also the same.

As mentioned before, the top four clubs in the league table are eligible to play in the UEFA Champions League which can bring in significant revenue, the incentive for practicing loss-leader pricing can be different between the elite clubs which have a realistic chance of achieving top four and other clubs which have significantly less chance of doing so. The consensus in profession is that there are so called "Top Six" in the EPL, which are superior in terms of financial power and overall level.[18] In another robustness check, we use the sample of English Premier League, with the control group being non-elite clubs in the league. Therefore, we use the same specification as our main one, except for replacing $\text{EPL}_i \times \text{Home}_i$ with $\text{Elite}_i \times \text{Home}_i$, with Elite_i being a dummy variable equals to one if club i is one of the "Top Six" clubs. The regression specification in this robustness check is therefore:

$$Y_{it} = \beta_0 + \beta_1 \text{Elite}_i + \beta_2 \text{Home}_i + \beta_3 \text{Elite}_i \times \text{Home}_i + \beta_4 X_i + \lambda_t + \varepsilon_{it}.$$

Possibly due to price stickiness or other reasons, a club normally does not drastically change the price of its tickets or other products from one season to the next. However, a club either promoted or relegated to another league does adjust their price more aggressively to meet different demand due to change of status. For instance, in our data, clubs promoted to the EPL would increase their cheapest matchday ticket price by almost 10% in the data, while the average change of cheapest matchday ticket price for other clubs that remain in the league is close to 0. Presumably, those clubs promoted to the EPL would have a higher incentive to practice loss-leader pricing than other clubs that were either promoted or relegated to other leagues. In another robustness check, we restrict our samples to clubs that were either promoted or relegated to another league in the new season and check to see if the change in ticket price would corroborate with the loss-leader pricing hypothesis. We use the same specification as in the main specification, but replace Y_{it} with the change in the price of either the ticket or product. Everything else is the same. The specification becomes

$$\hat{Y}_{it} = \beta_0 + \beta_1 \text{EPL}_{it} + \beta_2 \text{Home}_i + \beta_3 \text{EPL}_{it} \times \text{Home}_i + \beta_4 X_i + \lambda_t + \varepsilon_{it},$$

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18 The "Top Six" are Arsenal, Chelsea, Liverpool, Manchester United, Manchester City, and Tottenham Hotspur. These six clubs have occupied most of the top six spots in the EPL for the six seasons covered in the sample. Out of the possible 36 spots, only four were occupied by non-Top Six clubs, they are Everton (x2), Leicester (x1), and Southampton (x1).

where $\hat{Y}_{it}$ is the annual growth of Y_{it} from its previous season. We would expect β_3 to be negative as well.

6 Results

We observe that clubs in the EPL are more likely to practice loss-leader pricing. Tables 4 and 5 present the estimation results from our main specification using various categories of ticket and complementary product.[19] Column 3 of Table 4 presents the result using the cheapest matchday ticket as the dependent variable and we see that clubs with higher home advantage charge less on average. The economic magnitude of such effect is not big though: one standard deviation increase in a club's home advantage would lead to the cheapest matchday ticket to

Table 4: Ticket prices regression.

	(1) Season (Low)	(2) Season (High)	(3) MatchDay (Low)	(4) MatchDay (High)	(5) Away (Low)	(6) Away (High)
EPL = 1	37.31	132.8***	12.88***	15.04***	5.615***	1.674
	(1.50)	(3.30)	(9.39)	(6.76)	(3.53)	(0.46)
Home advantage	−92.83	418.3***	−8.322**	12.72**	−11.48***	−7.625
	(−1.28)	(3.58)	(−2.09)	(2.01)	(−2.64)	(−0.87)
(EPL = 1)*home_adv	15.20	−17.79	−34.07***	−0.0441	1.282	14.78
	(0.14)	(−0.10)	(−5.55)	(−0.00)	(0.18)	(0.90)
Promotion	−2.352	−16.78	−0.0698	−1.055	−0.103	−1.409
	(−0.28)	(−1.25)	(−0.15)	(−1.45)	(−0.21)	(−1.38)
Relegation	0.239	13.68	1.322***	0.740	1.247**	1.367
	(0.03)	(0.97)	(2.75)	(0.97)	(2.45)	(1.21)
Capacity (10,000)	87.55***	164.0***	−0.190	8.641***	0.418	1.607**
	(18.00)	(20.87)	(−0.71)	(20.28)	(1.41)	(2.50)
League FE	Yes	Yes	Yes	Yes	Yes	Yes
TownCity FE	Yes	Yes	Yes	Yes	Yes	Yes
Season FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	789	788	788	787	703	392
R^2	0.79	0.86	0.76	0.90	0.80	0.77

t statistics in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

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[19] Results are similar if we only include the clubs in the English leagues, both in terms of statistical and economic significance.

Table 5: Complementary products prices regression.

	(1) Programme	(2) Pie	(3) Tea	(4) Adult Shirt	(5) Junior Shirt
EPL = 1	0.170	0.0942	−0.0456	4.620***	6.017***
	(1.39)	(0.83)	(−0.46)	(3.69)	(3.44)
Home advantage	0.162	1.842***	0.676**	0.0543	0.376
	(0.46)	(5.83)	(2.38)	(0.02)	(0.09)
(EPL = 1)*home_adv	0.158	0.560	−0.0427	−16.07***	−24.02***
	(0.29)	(1.08)	(−0.09)	(−2.74)	(−3.09)
Promotion	−0.0789*	−0.0544	−0.0172	−0.204	−0.313
	(−1.92)	(−1.55)	(−0.54)	(−0.57)	(−0.64)
Relegation	0.0964**	0.0439	0.0514	0.0279	−0.178
	(2.22)	(1.16)	(1.53)	(0.07)	(−0.33)
Capacity (10,000)	0.0113	0.0362*	0.103***	1.393***	1.303***
	(0.47)	(1.68)	(5.46)	(6.10)	(4.28)
League FE	Yes	Yes	Yes	Yes	Yes
TownCity FE	Yes	Yes	Yes	Yes	Yes
Season FE	Yes	Yes	Yes	Yes	Yes
Observations	782	711	727	525	391
R^2	0.68	0.90	0.80	0.84	0.81

t statistics in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

drop by only £0.7. However, the traditional home advantage effect is larger for the EPL clubs. A one standard deviation increase in an EPL club traditional home advantage is associated with an additional £3 drop in its cheapest matchday ticket (approximately 10% of the average price in this ticket category), compared to clubs in other English and Scottish leagues.

There is no evidence suggesting that loss-leader pricing in other types of tickets, such as the most expensive matchday tickets, season tickets, and away tickets. The non-results for the most expensive matchday tickets might be explained by the existence of second-hand market for this category of tickets. The non-results for season ticket prices might be explained by the large proportion season ticket revenue takes up of the overall ticket revenue for clubs in England and Scotland. The percentages of season ticket holders relative to overall attendance at games are between 53 and 73% in the top four tiers of English football, with the EPL clubs having 73% of attendants being season ticket holders. While the EPL clubs might have incentive to practice loss-leader pricing, they might choose to sacrifice the types of tickets that is less essential to their overall ticket revenue, i.e. the matchday ticket.

Clubs can potentially practice loss-leader pricing through complementary products that they sell inside the stadium. One potential candidate is beer. Unfortunately, we do not have information on the prices of beer. Another potential candidate is jersey, which, if fans put on the same home side jersey during the match, can make it a better "show" to sell on TV. Table 5 suggests that English Premier League might be practicing loss-leader pricing through jersey, though the economic magnitude of such effect is about half as much as we observed in the cheapest matchday ticket. We do not see any evidence of loss-leader pricing in the pricing of other complementary products.

To see if loss-leader pricing is more common in later years in our sample, we separately run the regression in the period 2012/13–2014/15 and 2015/16–2017/18. Tables 6 (seasons 2012/13–2014/15) and Table 7 (seasons 2015/16–2017/18) suggest that for both the cheapest and the most expensive matchday tickets (the magnitude of the coefficient is about three times larger in later seasons), there are more loss-leader pricing in the EPL in later years, which corroborates with the increasing proportion of TV broadcast revenue of the league over the years.

Table 8 shows the results using the other European clubs as the control group. Again, we see evidence of loss-leader pricing in the cheapest matchday ticket. Compared to other European clubs, a one standard deviation increase in traditional home advantage for an EPL club is correlated with a decrease of its cheapest

Table 6: Ticket prices regression period (seasons 2012/13–2014/15).

	(1) Season (Low)	(2) Season (High)	(3) MatchDay (Low)	(4) MatchDay (High)	(5) Away (Low)
EPL = 1	26.11	167.6**	8.171***	19.53***	10.15***
	(0.64)	(2.07)	(3.76)	(4.00)	(3.52)
Home advantage	41.88	426.5*	−12.15**	26.08**	−6.309
	(0.37)	(1.94)	(−2.05)	(2.06)	(−0.88)
(EPL = 1)*home_adv	−9.296	77.37	−18.67**	5.163	−20.61*
	(−0.06)	(0.23)	(−2.09)	(0.26)	(−1.77)
Promotion	15.77	−23.51	0.428	−1.800	−0.169
	(1.07)	(−0.81)	(0.54)	(−1.10)	(−0.19)
Relegation	−11.66	33.40	0.812	1.102	0.757
	(−0.81)	(1.18)	(1.06)	(0.69)	(0.85)
Capacity (10,000)	102.4***	156.1***	0.841**	8.355***	0.789*
	(14.43)	(11.10)	(2.24)	(10.46)	(1.72)
League FE	Yes	Yes	Yes	Yes	Yes
TownCity FE	Yes	Yes	Yes	Yes	Yes
Season FE	Yes	Yes	Yes	Yes	Yes
Observations	396	395	395	394	312
R^2	0.85	0.85	0.83	0.89	0.87

t statistics in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

Table 7: Ticket prices regression period (seasons 2015/16–2017/18).

	(1) Season (Low)	(2) Season (High)	(3) MatchDay (Low)	(4) MatchDay (High)	(5) Away (Low)
EPL = 1	19.53	124.0*	17.43***	20.28***	7.242***
	(0.40)	(1.80)	(6.89)	(6.77)	(3.19)
Home advantage	−261.5**	406.7**	−6.538	7.765	−6.702
	(−2.22)	(2.46)	(−1.08)	(1.08)	(−1.23)
(EPL = 1)*home_adv	11.90	−163.3	−53.57***	−43.17***	1.486
	(0.05)	(−0.53)	(−4.75)	(−3.24)	(0.15)
Promotion	−13.89	−22.22	−0.362	−1.324	−0.246
	(−1.02)	(−1.16)	(−0.51)	(−1.59)	(−0.39)
Relegation	2.464	−0.219	1.649**	0.575	1.509**
	(0.16)	(−0.01)	(2.12)	(0.63)	(2.15)
Capacity (10,000)	81.79***	173.4***	−1.054**	8.540***	−0.323
	(9.58)	(14.48)	(−2.39)	(16.38)	(−0.81)
League FE	Yes	Yes	Yes	Yes	Yes
TownCity FE	Yes	Yes	Yes	Yes	Yes
Season FE	Yes	Yes	Yes	Yes	Yes
Observations	393	393	393	393	391
R^2	0.77	0.89	0.78	0.94	0.80

t statistics in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Table 8: Ticket prices regression (European leagues).

	(1) Season (Low)	(2) Season (High)	(3) MatchDay (Low)	(4) MatchDay (High)	(5) Adult Shirt
EPL = 1	424.9**	−101.5	43.32***	−55.58	−14.81*
	(2.56)	(−0.19)	(5.19)	(−1.03)	(−1.92)
Home advantage	−11.46	−922.3	−10.47	−181.6**	4.721
	(−0.05)	(−1.15)	(−0.85)	(−2.29)	(0.51)
(EPL = 1)*home_adv	−690.6	1226.2	−106.9***	177.8	−31.78
	(−1.50)	(0.81)	(−4.60)	(1.18)	(−1.53)
Capacity (10,000)	3.615	59.00**	−0.0607	12.26***	0.415
	(0.51)	(2.54)	(−0.17)	(5.35)	(1.24)
League FE	Yes	Yes	Yes	Yes	Yes
TownCity FE	Yes	Yes	Yes	Yes	Yes
Season FE	Yes	Yes	Yes	Yes	Yes
Observations	154	154	154	154	157
R^2	0.76	0.57	0.76	0.69	0.81

t statistics in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Table 9: Ticket prices regression (EPL).

	(1) Season (Low)	(2) Season (High)	(3) MatchDay (Low)	(4) MatchDay (High)	(5) Away (Low)	(6) Away (High)
elite = 1	371.4***	578.0***	14.19**	30.03***	6.509	−57.01
	(4.91)	(3.82)	(2.50)	(3.59)	(0.98)	(−1.49)
Home advantage	426.0	1,439.5**	−45.11*	75.73**	−25.28	−305.2
	(1.35)	(2.27)	(−1.90)	(2.17)	(−0.83)	(−1.41)
(elite = 1) *home_adv	−449.4	−631.8	−51.06*	−58.75	−18.44	307.7
	(−1.13)	(−0.80)	(−1.71)	(−1.34)	(−0.52)	(1.42)
Capacity (10,000)	58.13***	111.0***	−1.675**	6.023***	−0.526	−0.0379
	(5.54)	(5.28)	(−2.12)	(5.19)	(−0.66)	(−0.02)
TownCity FE	Yes	Yes	Yes	Yes	Yes	Yes
Season FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	113	112	113	112	100	55
R^2	0.86	0.85	0.61	0.85	0.64	0.74

t statistics in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Table 10: Ticket prices growth regression (promoted/relegated clubs).

	(1) Season (Low)	(2) Season (High)	(3) MatchDay (Low)	(4) MatchDay (High)	(5) Away (Low)	(6) Away (High)
EPL = 1	−7.944	2.077	62.52***	14.59	16.14*	−19.81
	(−0.78)	(0.20)	(4.38)	(1.28)	(1.66)	(−1.07)
Home advantage	−2.535	−21.04	−3.114	−28.14*	−2.203	−5.363
	(−0.17)	(−1.35)	(−0.15)	(−1.69)	(−0.14)	(−0.18)
(EPL = 1)*home_adv	−2.983	−1.425	−216.4***	−10.16	−3.898	−5.310
	(−0.06)	(−0.03)	(−3.34)	(−0.20)	(−0.09)	(−0.06)
Relegation	−11.37***	−11.95***	−15.63***	−27.14***	−14.91***	−27.75***
	(−3.87)	(−3.92)	(−3.81)	(−8.28)	(−4.95)	(−5.58)
Capacity (10,000)	1.337	0.939	−0.770	2.794	−1.017	1.440
	(0.88)	(0.60)	(−0.36)	(1.65)	(−0.69)	(0.70)
League FE	Yes	Yes	Yes	Yes	Yes	Yes
TownCity FE	Yes	Yes	Yes	Yes	Yes	Yes
Season FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	141	141	141	140	126	59
R^2	0.26	0.24	0.37	0.53	0.61	0.63

t statistics in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

matchday ticket price by £8.5. We do not see any loss-leader pricing in the season tickets and the most expensive matchday tickets.

Table 9 restricts the sample to clubs in the EPL, and uses the elite clubs in the EPL as the treatment group, with the rest of the league as control group. Results suggest that the elite clubs are more likely to practice loss-leader pricing in both categories of season tickets and matchday ticket, though the estimate of β_3 is statistically significant only when the price of cheapest matchday ticket is used as a dependent variable.

In Table 10, we look at the clubs that were either promoted or relegated to a different league in the new season. As would be expected, a relegated club would drop its price on all types of tickets, ranging from 11 to 27%. While we see an average of 63% increase in the cheapest matchday ticket price after the club is promoted to the EPL, a club with higher home advantage by one standard deviation would see a drop in its cheapest matchday ticket price by approximately 20% compared to other clubs that are either promoted or relegated to a different league. Again, we do not see any evidence of loss-leader pricing in other types of tickets.

7 Conclusion

The effectiveness of loss-leader pricing strategy depends on the complementarities between the two related goods. One implication from the hypothesis of loss-leader pricing is that, when complementarities change due to technology or other reasons, the loss-leader pricing would change. Previous research has shown that revenue from the complements of music, such as music concert and iPod, increases because of the rise in music piracy. The surge of TV broadcasting revenue and the relative decline of the importance of revenue of ticket sales for the EPL provides us an opportunity to test the hypothesis. Using price data for match tickets, we find supporting evidence that EPL clubs are more aggressive in adopting loss-leader pricing, compared to other clubs in other leagues in which TV broadcasting revenue growth is not as strong.

Appendix

Home advantage and attendance rate

An implicit assumption in our analysis is that a higher attendance rate in a game implies stronger home advantage for the home team. Here we use the head-to-head results, attendance, and other information for all the league games in England and

Scotland between 2012/13 and 2017/18 seasons to test the validity of the assumption. In particular, we run the following OLS regression:

$$\text{HomeWin}_{ijt} = \alpha_0 + \alpha_1 \text{Attendance} + \alpha_2 X_{ijt} + \varepsilon_{ijt},$$

Table A1: Is attendance related to win probability?

	(1)	(2)	(3)	(4)
	Home game outcome (win = 3, draw = 1, loss = 0)			
Attendance ratio	0.585[***]	0.355[***]	0.359[***]	0.155[***]
	(14.49)	(8.61)	(7.99)	(2.76)
Away team controls	Yes	Yes	Yes	Yes
Season FE	No	Yes	Yes	Yes
League FE	No	No	Yes	Yes
Home Team FE	No	No	No	Yes
Observations	21,361	21,361	21,361	21,361
R^2	0.01	0.04	0.04	0.07

where HomeWin$_{ijt}$ equals to 3 when the home team, i, wins, 1 when it is a draw, 0 when the away team, j, wins. Attendance is the attendance ratio of the game, that is the ratio of the actual attendance and the stadium capacity. X_{ijt} includes controls for the game such as popularity of the away team (measured by their average home attendance), league ranking of the away team, season fixed effects, league fixed effects, and home team fixed effects.

Table A1 below shows that, in all specifications, a higher attendance ratio is associated with higher probability of a home win, even after controlling for the strength of the home and away teams.

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