ATTENDANCE DEMAND FOR SOCCER:
A SPATIAL CROSS-SECTIONAL APPROACH

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DECLARATION

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institution of learning.
ABSTRACT

The cost of a return journey to a soccer match can often be comparable to, or even exceed the admission price. However, in spite of the importance of travel costs, previous studies on the demand for live soccer generally exclude travel costs from the analysis. The thesis explores the consequences of this omission and shows that the likely effect is to bias estimates of the ticket price elasticity downwards. The thesis also argues that the previous estimates of the ticket price and income elasticities are likely to be biased due to generic problems with the time series approach and methodological problems with particular pooled studies. To overcome these problems, the travel cost methodology, developed in the economics of outdoor recreation, is adapted to permit analysis of demand relationships in professional soccer. Attendance at Premier League matches is modelled as a function of travel costs and other factors, such as the admission price and consumer income, using data from a national fan survey. From the results, ticket price elasticities are estimated that are more consistent with profit maximisation than previous estimates. Subsequent analysis on the relationship between attendance and income distinguishes between the decision to become a fan and, given that one is a fan, the question of the number of games to attend in a season. The first decision is shown to be positively related to income, via a social class proxy, and the second decision unrelated to income, giving a positive income elasticity of demand.
Chapter 1: Introduction

The focus of this thesis is on the ticket price and income elasticities of the demand for live soccer. The general finding in the literature is that attendance is highly unresponsive to changes in a club's ticket price, holding other factors constant, that is demand is highly price inelastic. This is an interesting finding for soccer clubs and their fans. It implies for the clubs that, in order to increase their gate receipts, they should increase their ticket prices. The rise in ticket prices would more than compensate for falls in attendance. However supporters would tend to oppose a rise in the ticket price, unless perhaps the higher gate receipts are spent on more talented players, improving the club's performance on the pitch.

Inelastic demand is also an interesting finding for economists. It is frequently assumed that professional sports clubs maximise profits, but this implies a ticket price elasticity just above unity, rather than a highly inelastic demand. Most of a club's costs are fixed costs (e.g. wages), so the marginal cost of admitting one more spectator is very small, perhaps limited to money handling costs, the cost of one more steward and the cost of litter collection. Profits are maximised where marginal revenue equals marginal cost. With a zero marginal cost this yields a ticket price elasticity of unity and with a minimal marginal cost a ticket price elasticity just slightly more elastic than minus one. Therefore the finding of inelastic ticket pricing is contrary to prior expectations.

In contrast to the ticket price elasticity, the evidence on the income
elasticity of demand for live soccer is mixed. Some studies have found that soccer is a normal good, so an increase in consumer income increases the demand for live soccer holding other factors constant. Others have found that soccer is an inferior good, so an increase in consumer income reduces attendance.

In this thesis I propose that the puzzling ticket price elasticities and the disagreement over the income elasticity are due to methodological problems with the previous studies. Travel costs account for a significant proportion of the total costs of attending a soccer match but are generally ignored in previous studies. Estimates of the ticket price elasticity are therefore likely to have been subject to omitted variable bias.

Previous studies use either a time series approach or a pooled approach to estimate the demand for live soccer. With the former, attendance is estimated for a single club or a single league over time. However, with the latter, attendance is estimated across time and clubs. It is argued that generic problems with the time series approach and methodological problems with particular pooled studies have yielded erroneous estimates of the ticket price and income elasticities.

In order to correct earlier estimates of the price and income elasticities, a new approach is used to estimate the demand for live soccer. It gives due weight to travel costs and employs cross sectional data on individual fans rather than the usual time series or pooled data.
The thesis is organised as follows. The current literature on the demand for live soccer is reviewed in chapter two, with particular emphasis on the ticket price and income elasticities. A new spatial econometric model is presented in chapter three. In chapters four to seven, the model is used to estimate ticket price and income elasticities for clubs in the English Premier League. The thesis ends with a summary of the main conclusions.
Chapter 2: The ticket price and income elasticity of the demand for live soccer

There are two types of soccer supporter. The first type of supporter attends live soccer matches in a stadium. The second type feels an affinity with a club but does not attend any live games. A secondary supporter only buys club merchandise and/or watches soccer on television. For example, Cannon and Hamil (2000) suggest that Manchester United Football Club has approximately one hundred and fifty thousand primary supporters, who attend live games, and three million secondary supporters.¹

A number of studies have sought to model live soccer attendance by primary supporters. The level of attendance is assumed to be a linear function, or one that can be linearised, of a range of socio-economic and soccer specific factors. The socio-economic factors include the ticket price that clubs charge fans for admission into a stadium, consumer income and the population in a club's catchment area. Home and away supporters attend a soccer match, so the size of both teams' catchment areas may affect attendance. The football specific factors often include the quality of the home and away teams (perhaps measured by their league standings prior to a match), lagged attendance to capture habit persistence, a team's progress in cup competitions and whether a team was promoted or

¹ Cannon and Hamil give no citation to support their estimate of the number of passive fans and there is no indication whether the estimate pertains to support in Britain or worldwide. The figure would appear conservative if it related to worldwide support. For example, according to a report in the July 2002 issue of Soccer Investor fully one-third of Spanish football supporters regarded Manchester United as their "favourite foreign team".

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relegated in the previous season. The weather conditions, whether a match is played at the weekend or on a weekday, the degree of outcome uncertainty and whether a match is televised may also affect match attendance.²

Special emphasis is given to outcome uncertainty. For example, Gratton and Taylor (1990) state that "Uncertainty of outcome is the key to demand identified by economists" (page 238). Three different types of outcome uncertainty are identified. The first type is long run uncertainty. This is concerned with the domination of the league by a group of clubs over a sustained period. It is thought that domination by one club over several seasons will diminish attendance at the unsuccessful clubs and eventually at the successful club through a satiation effect.

The second type of uncertainty is about the outcome of an individual match. The match uncertainty hypothesis proposes that spectators prefer a close contest. When spectators anticipate a low probability of a home win (i.e. a one sided match) there is low match uncertainty and attendance suffers. However as the ex ante probability of a home win increases, attendance also increases until a maximum is reached. Further increases in the probability of a home win reduce match uncertainty and attendance. Thus there is likely to be a quadratic relationship between attendance and the probability of a home win (Peel and Thomas (1988) and Forrest and Simmons (2002)).

² Cairns (1990), Cairns et al (1986) and Downward and Dawson (2000) review the literature on the demand for professional team sports.
The final type of uncertainty is about the identity of a season's champion and relegated teams. Attendance is likely to be higher if a match is significant in terms of the championship and relegation battles. This may partly explain why attendance is often higher towards the end of the season when many matches have a great bearing on the outcome of the season, as the promotion and relegation battle heats up (Jennett (1984)).

The focus of this thesis is on the effect of changes in the ticket price or income on live attendance. The effect of a change in the ticket price on live attendance, holding all other factors constant, is measured by the ticket price elasticity of demand. Similarly the effect of a change in consumer income on live attendance, holding all other factors constant, is measured by the income elasticity. The point ticket price elasticity is given by the partial derivative of attendance with respect to the ticket price multiplied by the ratio of the prevailing ticket price to attendance. The income elasticity is given by the partial derivative of attendance with respect to consumer income multiplied by the ratio of consumer income to attendance.

The following table shows the estimates of the ticket price and income elasticities from a wide range of studies on the demand for live soccer, where estimates are available. A number of the studies omit the ticket price and/or income (indicated by blank spaces). However the omissions are usually well justified. For example, Baimbridge (1997) excludes the ticket price from a model of attendance at the 1996 European Championship since the pricing structure was
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the same for every match. Peel and Thomas (1996) exclude the admission price and income from a model of the change in attendance at repeat fixtures, since the ticket price and income are common to both matches. Dobson and Goddard (1995) exclude income due to a lack of data (a ten-year gap between censuses and definitional changes). In addition to the elasticities, the table also shows to which country a study relates (primarily England), whether the study uses time series or pooled data, the unit of observation (match or season) as well as the time period and the division under consideration.

The table shows that there is a general consensus in the literature about the ticket price elasticity of demand for live soccer. All of the estimates of the ticket price elasticity are negative except for Baimbridge et al (1996). We would expect the ticket price elasticity to be negative given the rarity with which the "law of demand" has been empirically challenged; an increase in the ticket price should reduce live attendance, other factors remaining constant. In addition, most of the estimates are on the inelastic portion of the demand curve. For example, Dobson and Goddard (1995) estimate a ticket price elasticity of -0.078 at Division One prices and Bird (1982) estimates a ticket price elasticity of -0.22 for the entire English Football league (these values are significantly different from zero at the 1% and 5% level respectively). Szymanski and Smith (1997) estimate a ticket price elasticity of -0.34 for an English Football League panel (this is significantly different from zero at the 5% level) and Simmons (1996) finds a median ticket price elasticity of -0.63 across seventeen large urban based English clubs.
Economists classify demand as elastic, inelastic or unit elastic according to the value of the ticket price elasticity. If the ticket price elasticity is between zero and minus one then demand is inelastic or relatively unresponsive to changes in the ticket price. However demand is termed unit elastic if the ticket price elasticity equals minus one and it is elastic, or relatively responsive to changes in the ticket price, if the ticket price elasticity is more negative than minus one.

The studies measure the ticket price either as an average price, equal to total gate receipts divided by attendance, or as the minimum price available at a ground. Up to 1976 the English F.A. set a minimum nominal ticket price that was revised annually but was subject to a club premium. The two ways of measuring the ticket price should yield comparable estimates of the ticket price elasticity, since “the two price series were highly correlated” (Cairns 1990, p. 10).  

In contrast with the ticket price elasticity, there is substantial disagreement over the income elasticity of demand. Half of the studies (where there is a significant income effect) find that attendance has a positive income elasticity of demand and the other half find a negative income elasticity of demand. A positive income elasticity signifies that soccer is a normal good, that is an increase in consumer income increases live attendance other things being equal. In contrast, a negative income elasticity means that soccer is an inferior good, so an increase in income reduces live attendance, holding other factors constant. Thus it is not clear

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3 The coefficient of correlation between the real average admission price in the English League and the minimum admission price is +0.92. I calculated this value from data collected from 1925/26 to 1975/76 and presented by Dobson and Goddard (2001), pages 74-75.
from the existing literature whether soccer is a normal good or an inferior good.

For example, Simmons (1996) finds that soccer is a normal good. The income elasticity ranges from +1.03 to +3.74, across five clubs showing a significant income effect. The median income elasticity is +1.59. However Bird (1982) finds that live attendance is an inferior good. Total league attendance has an income elasticity of −0.6. Division One has an income elasticity of −0.49, Division Two −1.15 and Divisions Three and Four have a joint income elasticity of −0.96 (all are significantly different from zero at the 1% level). The first division is less of an inferior good than the lower divisions, presumably because the first division offers a relatively higher standard of soccer.

The studies tend to measure income by current real regional earnings. In the absence of data on real earnings, the regional unemployment rate is often used as a proxy for income (e.g. Jennett 1984 and Dobson and Goddard 1996). However the unemployment rate can only show whether soccer has a positive or negative income elasticity of demand. The unemployment rate cannot yield a precise value for the income elasticity. If soccer is a normal good then an increase in the unemployment rate reduces attendance by reducing disposable income. Attendance may also fall among people who keep their job due to increased feelings of job insecurity. However, if soccer is an inferior good then an increase in the unemployment rate increases attendance, perhaps because soccer provides a welcome distraction from economic hardship.
Bird (1982) measures income by total real consumer expenditure and Peel and Thomas (1988) and Hart et al (1975) both capture changes in income by a time trend (e.g. 1 for the first match, 2 for the second match etc). However consumer expenditure may be a poor proxy for income due to changes in the propensity to save and changes in taxation. A time trend will capture changes in private income but it will also reflect any other long-term reasons for a decline in attendance, such as changes in the ticket price and other time dependent variables. Therefore the evidence on the sensitivity of attendance to changes in income from Bird (1982), Peel and Thomas (1988) and Hart et al (1975) should be interpreted with care. Nonetheless, there is still substantial disagreement among the remaining studies over whether attendance is a normal good or an inferior good.

It may seem that the ways in which the studies measure income and the ticket price are quite varied, but there is even greater heterogeneity in how other explanatory variables are measured. For example, outcome uncertainty is measured in a myriad of ways. Peel and Thomas (1988, 1996) use bookmaker betting odds fixed prior to a match where these are assumed to be unbiased estimators of the probability of a home win and consequently of match uncertainty. Forrest and Simmons (2002) also use fixed betting odds but correct them for possible deviations from market efficiency. The method used by Jennett (1984) and also by Dobson and Goddard (1992) to measure seasonal uncertainty is significantly different from the technique employed by Kuypers (1996, 1997) and Garcia and Rodriguez (2002). Jennett (1984) and Dobson and Goddard (1992) measure the championship significance of a match, from the perspective of home and away
supporters, by examining the number of games remaining before the close of the season and the difference between the final points total of the league winner and the current points total of the team in question. A flaw in this approach is that fans do not know the final league winner and that club’s points at the end of the season. In contrast Kuypers (1996, 1997) and Garcia and Rodriguez (2002) measure the championship significance by considering the points total of the current league leader, not the eventual champions. The mathematical behaviour of the season significance index also differs. For Jennett (1984) and Dobson and Goddard (1992), a higher value of the index indicates greater seasonal significance, whilst a smaller value indicates greater seasonal significance in the case of Kuypers (1996, 1997) and Garcia and Rodriguez (2002). In comparison, the methods by which the studies measure the ticket price and income are much less varied.

Economic theory does not predict whether soccer attendance is a normal good or an inferior good. Becker's (1965) theory of time allocation shows that an increase in the wage rate may increase the number of hours that an individual works and therefore reduce recreational time. On the other hand, an increase in the wage rate may also increase recreational hours resulting in a backward bending labour supply curve. These two possibilities suggest that attendance at a soccer match (a recreational activity) can be a normal or an inferior good.

However, theory predicts that soccer clubs should have a ticket price elasticity which is either unit elastic or elastic. Demand should not be highly price inelastic. It is often assumed that professional sports teams maximise profits,
following El Hodiri and Quirk (1971). For example, Quirk and Fort (1992) and Hoehn and Szymanski (1999) portray professional sports teams as profit or revenue maximisers. The analysis assumes that the profit from live attendance $\Pi$ equals a team's gate receipts $R$ minus a team's costs $C$, where gate receipts are given by the ticket price $TP$ multiplied by attendance $Q$. Attendance is a function of the ticket price and, since a team has discretion over its ticket price, $\delta Q/\delta TP < 0$:

$$\Pi = R - C = TP \cdot Q(TP) - C$$

Profits are maximised where marginal revenue ($\delta R/\delta Q$) equals marginal cost ($\delta C/\delta Q$).

$$\frac{\partial \Pi}{\partial Q} = \frac{\partial R}{\partial Q} - \frac{\partial C}{\partial Q} = 0$$

However, most of a soccer club's costs are fixed with respect to changes in attendance (e.g. wages), so the marginal cost is very small. With a zero marginal cost, setting marginal revenue equal to marginal cost yields a ticket price elasticity of unity. The goals of maximising profit and revenue are then equivalent.

$$\frac{\partial R}{\partial Q} = TP + \frac{\partial TP}{\partial Q} \cdot Q = 0$$

$$\therefore \text{Ticket Price Elasticity} = -\frac{\partial Q}{\partial TP} \cdot \frac{TP}{Q} = -1$$
With a minimal marginal cost, setting marginal revenue equal to marginal cost yields a ticket price elasticity that is just less than minus one. Thus neither profit nor revenue maximisation is apparently consistent with an inelastic demand.

It has been suggested that soccer clubs have other goals besides maximising profits. Sloane (1971), Carmichael and Thomas (1993), Szymanski and Smith (1997) and Kuypers (1996) assume that a soccer club maximises a composite utility function based on profits and playing success subject to maintaining financial viability. The utility is the utility of all of the club's stakeholders (players, managers, directors, fans and shareholders), since the goal of achieving the greatest success on the pitch is common to everyone who has an interest in the club. For example, Morrow (1997) demonstrates that even shareholders benefit from success on the pitch; the price of soccer shares increase when a team wins crucial matches.\(^4\) Success means different things for different clubs. For the top clubs, success on the pitch may translate into winning the championship, but for lesser clubs success may mean gaining promotion to a higher division or avoiding relegation to a lower division.

However even if clubs maximise success, we would still expect a ticket price elasticity near to unity. By maximising gate receipts a club will have more

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\(^4\) A significant number of soccer clubs are quoted on the stock exchange or the Alternative Investment Market. Tottenham Hotspur was the first club to be quoted on the Stock Market in October 1983. Manchester United followed suit in June 1991 and since then a further sixteen English clubs have gained plc status along with two Scottish clubs (with a combined value of over £1bn). It may be argued that the market for corporate control should then pressure clubs directors to maximise profits. In that case, profits (or revenue) may carry a greater weight in the utility function than in earlier periods.
funds to spend on talented players, and this should in turn lead to greater success on the pitch. Football is a team sport, but nevertheless it should still be true that a team with more talented players should win more games than a team with fewer skilled players. In mathematical terms, success (S) is a function of a team's wage bill (W). However, clubs maximise success subject to a breakeven constraint (i.e. such that revenue equals a team’s wage bill plus fixed costs such as the cost of maintaining a stadium).\(^5\)

\[
\text{Max } S = S(W) \\
\text{subject to } TP.Q(TP) = W + \text{fixed cost}
\]

Substituting the breakeven constraint into the objective function gives:

\[
\text{Max } S = S(TP.Q(TP) - \text{fixed cost})
\]

\[
\therefore \frac{\partial S}{\partial Q} = \frac{\partial S}{\partial R} \left( TP + \frac{\partial TP}{\partial Q} \right) = 0
\]

\[
\therefore \text{Ticket Price Elasticity} = \frac{\partial Q}{\partial TP} \cdot \frac{TP}{Q} = -1
\]

Therefore, maximising success yields a ticket price elasticity of minus one.

There are a few occasions when maximising playing performance may

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\(^5\) Financial viability may involve making a loss, for example if a generous benefactor supports a club. In terms of the equations, this would mean that a club has a negative fixed cost.
conflict with the objective of maximising profits. For example to win games, a
team may adopt a defensive style of play. Casual fans may not approve of this
tactic, so attendance and gate receipts may fall. Winning matches may involve a
club buying stars players at a substantial cost, which will reduce profits.
Nonetheless, we should expect, more often than not, a positive correlation between
a club's financial performance and its performance on the pitch.

Evidence to support this claim is provided by Dobson and Goddard (1998).
A Granger Causality test is applied to a club specific VAR model for final league
position and annual gate receipts at seventy-seven clubs with continuous
membership of the Football League or Premier League from 1946/47 to 1993/94.
There are twenty-four significant diagnoses of lagged revenue affecting current
performance but only ten significant diagnoses of lagged performance affecting
current revenue. It is not shown whether the effects are positive or negative, but
the numbers suggest that the strongest relationship is from lagged revenue to
performance. To quote Dobson and Goddard (1998) the numbers “lend empirical
support to the popular notion that the chances of success are loaded in favour of
the wealthiest clubs” (page 1651). So maximising financial performance appears
to be an effective means of maximising playing success and a failure to price
where marginal revenue equals marginal cost a deviation from maximising
behaviour.

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6 A positive relationship from lagged revenue to current performance means that $\delta S/\delta R$ has a
positive value. The relationship from lagged performance to current gate receipts may be positive
(a successful team attracts more spectators) or negative (defensive tactics reduce attendance).
Studies on other spectator sports have also yielded estimates of the ticket price elasticity between zero and minus one. The finding of inelastic ticket pricing is not unique to soccer. For example, Fort and Quirk (1996) model attendance at Major League Baseball and estimate a ticket price elasticity of -0.43 for the American League and -0.50 for the National League, evaluated at the mean ticket price and attendance in each case. Burdekin and Idson (1991) find attendance to be completely unresponsive to price in the National Basketball Association and Welki and Zlatoper (1994) estimate a ticket price elasticity of -0.275 for American Football. Borland (1987) and Borland and Lye (1992) model attendance at Australian Rules Football and report a ticket price elasticity of -0.58 and -0.59 respectively. In a study of international test match cricket, Hynds and Smith (1994) report a ticket price elasticity of -0.38. To quote Fort (2000), "Inelastic ticket pricing for team sports has been a recurrent finding for nearly thirty years" (page 10).

In an effort to reconcile such estimates of the ticket price elasticity with the goal of profit maximisation, Marburger (1997) and Fort (2000) both hypothesised that a team may profit maximise and price on the inelastic portion of attendance demand due to complementary sales. When a fan attends a sport match he or she may buy, for example, club merchandise or match day programmes. If complementary sales are sufficiently large to compensate for a fan's negative marginal ticket revenue, this will lead a profit maximising club to set a ticket price where demand is price inelastic. Fort (2000) also hypothesised that a Major League Baseball team may price on the inelastic region of attendance demand and profit
maximise, if the team's local marginal TV revenue is large enough relative to the average marginal TV revenue in the rest of the league. This argument supposes that a club may increase its share of TV revenue by admitting an additional spectator, perhaps because a large number of spectators make for a better television spectacle. In terms of the previous equations, a team's marginal revenue \((\delta R/\delta Q)\) includes complementary sales and TV revenue.

However, while these explanations may be applicable to American team sports, they cannot so easily account for the inelastic ticket pricing observed for soccer. Most of the studies in table 2.1 relate to a time when the sale of soccer merchandise was very limited and TV revenue was minimal or non-existent. Complementary sales and TV revenue would have to be extraordinarily important to explain the estimates in the table. The Deloitte and Touche annual report into the finances of soccer clubs shows that during the 1997/98 season the English Premier League had a combined turnover of £569 million. The largest slice of total revenue came from paying spectators at the turnstile (36%), TV receipts accounted for 30% of turnover and merchandising and other commercial income represented 34% of turnover.\(^7\) This contrasts with the 1970s when according to Szymanski and Kuypers (1999, page 41) gate receipts accounted for approximately 80% to 95% of turnover at a top-flight club.

Britain's first live broadcast of a Football League match was not until 1983 and the first significant TV contract, in terms of the amount of money, was signed as late as 1992/93. Rupert Murdoch's BSkyB broadcasting company paid the
Premier League £191.5 million for the rights to broadcast sixty live games per season between 1992/93 and 1996/97. The rights for the next five years cost BSkyB £670 million.\textsuperscript{8}

Complementary sales can explain inelastic ticket pricing only if the product is bought at the stadium. However a significant proportion of soccer merchandise is currently sold away from the stadium. Indeed clubs like Manchester United even have their own chains of shops in foreign countries. In addition, TV broadcasting rights are sold collectively in England and for the most part the revenue is distributed evenly between the clubs. Therefore Fort's scenario of local TV revenue related to a club's attendance is not relevant to English soccer clubs. Under the BSkyB deal, fifty percent of the TV revenue is divided equally between the Premier League clubs and the recently relegated clubs. The next twenty five percent of the money is distributed between the clubs according to the number of times that they appear on BSkyB, but every club is guaranteed a minimum of three appearances per season. Only the distribution of the last twenty five percent varies greatly between the clubs; clubs receive increasing amounts of money for each place above the bottom of the league. Thus the estimates of the ticket price elasticity in table 2.1 cannot be adequately explained by the effect of complementary sales or TV revenue.

Another explanation for inelastic ticket pricing can be seen from the following diagram. The club's demand curve is given by $D_1$. It charges a price $P_1$

\textsuperscript{8} Source: Monopoly and Mergers Commission (1999), paragraph 4.131.
which leads to an attendance $Q_1$. The club then reduces its price to $P_2$. It would be tempting to say that the decrease in price increases attendance to $Q_2$. However this would be to ignore what may be termed a "crowding-in" effect. The experience of attending a soccer match is enhanced if there are more fans sitting alongside. A larger crowd improves the atmosphere at the game. Demand is a function of capacity utilisation. Thus the increase in attendance to $Q_2$ shifts demand to the right, as the larger crowd attracts yet more supporters to the game. There are two demand curves. A less elastic demand curve such as $D_1$ (ignoring crowding in effects) and a more elastic demand curve $D_3$ (allowing for crowding in effects). $D_1$ shows demand if attendance is expected to be $Q_1$, $D_2$ shows demand if attendance is expected to be $Q_3$ and $D_3$ shows all equilibrium points such that actual equals expected attendance.

Figure 2.1: “Crowding in” following a fall in price
Time series studies are usually concerned with season-by-season changes in attendance and price while pooled studies are predominately concerned with match-by-match changes. If spectators take longer than these time frames to adjust their expectations of the size of the soccer crowd then the previous studies measure the more inelastic demand curve and therefore only pick up short run responsiveness of ticket sales to price. This may explain the inelastic estimates in the literature though it is difficult to guess just how fast fans' adjust their expectations of the size of the crowd.

Becker (1991) extends this analysis in the context of pricing at a restaurant. In the Becker article a consumer’s satisfaction from visiting a restaurant depends not only on how full the restaurant is (i.e. capacity utilization as above), but also on the number of customers waiting outside (i.e. potential demand). Visitors to a restaurant are uncertain about the quality of the restaurant. A large queue is taken as an assurance that the restaurant is of a high quality. The emphasis on potential demand can explain why restaurants do not raise the price of a meal. By pricing low on the inelastic portion of demand they maintain the benefits associated with the queue: if they increased price, demand would shift inwards because the restaurant no longer benefited from the advertising that the queue gives the establishment.

However Becker’s insight is unlikely to be relevant to a soccer club’s pricing decision. In contrast with a restaurant, where a visitor may have little prior knowledge of the quality of the service and therefore takes note of the size of the
queue, soccer fans are usually very well informed about soccer clubs. Newspapers and television provide an abundance of information on the clubs. It should also be borne in mind that soccer is a spectator sport. A fan’s attention is likely to be focused on the events on the field, rather than the number of people standing outside the stadium.

The preceding arguments (complementary sales, TV revenue, crowding in and Becker’s analysis) maintain that the previous estimates of the ticket price elasticity are unbiased. It could be optimal for a profit maximising club to price on the inelastic portion of demand because of these various factors. However, in this thesis we adopt a different approach. It is proposed here that severe departures from unit elasticity do not have to be “explained” because flawed econometric modelling has resulted hitherto in biased estimates of the ticket price elasticity. The true value of price elasticity may be sufficiently close to minus one that no “anomaly” exists that needs to be explained.

The demand for soccer is a composite demand. The parent demand is the demand to watch a game of soccer but this has a number of derived demands associated with it, such as the demand for travel to and from the ground and for participation related goods such as food and refreshments. The component parts of the composite demand vary in importance but the ticket price and travel costs tend to be the most important elements in the composite price. The small number of professional soccer venues (in particular top-division venues) means that if a person wishes to watch a soccer match, he or she may have to be prepared to travel
a substantial distance to a game. Therefore a complete model of consumer demand should specify the price variable as the ticket price plus travel costs. However, previous studies generally confine their attention to the admission price. Little or no reference is made to travel costs. This will lead to omitted variable bias in their estimates of the ticket price elasticity.

Only the study by Bird (1982) explicitly includes travel costs in the analysis. Bird (1982) defines the price variable as the Football League’s minimum ticket price plus the implicit price level of total consumer expenditure on running costs of private vehicles and other transport (both deflated by the retail price index). The study by Bird (1982) should be applauded for recognising that travel costs form an important part of the total price of attendance. However, the specification of travel costs is still incomplete. Consideration is given to the direct costs of travel but no consideration is given to time costs. As a result the estimate of the price elasticity from Bird (1982) is still likely to be biased. The cost of travel has two components: the direct cost (such as petrol or bus fares) and the time cost. Time that is spent travelling to a soccer match has an opportunity cost and this should also be included as part of the travel cost.

Several studies, such as Baimbridge et al (1996), Dobson and Goddard (1992), Falter and Perignon (2000), Forrest and Simmons (2002), explain match attendance by the distance in miles between the grounds of the two teams contesting a match. However this is not a satisfactory measure of the influence of travel costs. The distance variable reflects the fall of the visiting team's support
with distance but it ignores the travel cost impediment to home supporters who account for the bulk of a soccer crowd. The distance variable is also contaminated by a "derby effect". A match between two neighbouring teams is likely to attract a large number of spectators not only because of the small travel costs of away supporters, but because of the strong rivalry between the two teams. The latter is a matter of tastes and should be distinguished from the financial and other costs of travel. Any treatment of travel costs should measure the travel costs of home supporters (direct costs and time costs) and control for affinity effects.

Omitting travel costs from the analysis leads to downward bias in previous estimates of the ticket price elasticity. Simmons (1996) reports that "over the period 1962-91 the real price of football match admissions rose on average by about 4 or 5% per season" (page 141). This is confirmed by graphs of the real average admission price in Szymanski and Kuypers (1999). At the same time travel costs to a soccer match have been falling. The following graphs show the proportion of households with no car and real car running costs per mile. In 1951 86% of households owned no car. By 2000 just 27% of households owned no car. To quote Szymanski and Kuypers (1999, page 48). "In 1951 there were 2.4 million cars, a decade later it had risen to 6 million and by 1971 this had doubled to 12 million" (Szymanski and Kuypers 1999, page 48). Not only have car ownership rates increased but car running costs have fallen over time. Between 1950 and 2000 real car running costs fell by 69%. The rise in the admission price will serve to reduce attendance and the fall in travel costs will serve to increase attendance. Excluding travel costs attributes the effect of the lower travel costs to
the ticket price, biasing the ticket price elasticity downwards. Therefore the previous estimates of the ticket price elasticity may be inelastic because of the omission of travel costs. If studies included travel costs we would expect the ticket price elasticity to be nearer to unity.

**Figure 2.2: Proportion of households with no car**

![Graph showing proportion of households with no car from 1951 to 2000](source: Table 9.4, Transport Statistics Great Britain: 2001 edition)
With travel costs in the model, it is possible to define the consumer price elasticity, which shows the effect of a change in the full consumer price (the ticket price plus travel costs) on attendance, holding all other factors constant. The consumer price elasticity is always greater in absolute value than the ticket price elasticity, since a given proportionate change in the total (ticket price plus travel costs) must have a larger impact on attendance than a proportionate change in only one component. However only the ticket price elasticity has a bearing on a club's optimal pricing strategy.  

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9 It should be noted that Bird (1982) reports values only for the consumer price elasticity. No estimates are given for the ticket price elasticity. However, we can surmise that the values of the ticket price elasticity are likely to be only slightly smaller than the estimates of the consumer price elasticity, since the study notes that most of the variation in the composite price is due to variations in the real admission price.
Some previous studies have noted the importance of travel costs but have excluded travel costs due to a lack of data. For example in a study of attendance at Australian Rules football matches, Borland (1987) notes that the omission of travel costs "may be a source of "errors-in-variable" bias since the true price measure cannot be included as an explanatory variable" (page 222). Similarly Gratton and Taylor (1995) write that "It would be misleading for analysts and managers alike simply to monitor the changes in entrance charges against the quantity demanded without taking into account the composite commodity relationships" (page 247). However, both studies highlight the difficulties of obtaining reasonable data on travel costs.

Apart from the consideration of travel costs, the puzzling estimates of the ticket price elasticity of the demand for live soccer and the disagreement over the income elasticity may also be due to generic problems with the time series approach and problems with particular pooled studies. Time series studies estimate attendance across time for a single club or league, usually over a long period of time and using seasonal data. Pooled studies, on the other hand, estimate attendance across time and clubs, usually over a small number of seasons and based on match data.

Time series estimates of the income elasticity are sensitive to the time period under consideration. We could obtain any income elasticity that we wish for by carefully selecting the dates. This is apparent from the first column of the following table.
Table 2.2: Income elasticity by leisure pursuit and period  

<table>
<thead>
<tr>
<th>Date</th>
<th>Soccer</th>
<th>Soccer + hooliganism</th>
<th>Cinema</th>
<th>MLB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1947-1977</td>
<td>negative</td>
<td>negative</td>
<td>negative</td>
<td>positive</td>
</tr>
<tr>
<td>1978-1986</td>
<td>negative</td>
<td>insignificant</td>
<td>insignificant</td>
<td>positive</td>
</tr>
<tr>
<td>1987-1999</td>
<td>positive</td>
<td>insignificant</td>
<td>positive</td>
<td>positive</td>
</tr>
<tr>
<td>1947-1999</td>
<td>negative</td>
<td>negative</td>
<td>negative</td>
<td>positive</td>
</tr>
</tbody>
</table>

Using data on aggregate Football League attendance (from Dobson and Goddard 2001, table 2.8) and UK real GDP (from www.statistics.gov.uk) I estimated a crude measure of the income elasticity (i.e. employing univariate analysis) in four time periods (1947-77, 1978-1986, 1987-1999 and 1947-1999). Column one shows that prior to 1986 live soccer was an inferior good by virtue of the fact that at that time spectator numbers were decreasing while average income was increasing. However after 1987 live soccer was a normal good. Over time there have been substantial swings in the demand for live soccer as documented by Szymanski and Kuypers (1999, pages 43-55). Soccer attendance peaked immediately after the war but it then fell during the 1950s, 1960s and 1970s only to recover from the mid-1980s. The changes in attendance were such that we can obtain different estimates of the income elasticity by measuring over different periods.

Time series studies are also sensitive to the treatment of hooliganism.

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10 In a few cases it is not possible to estimate the income elasticity for the entire period as indicated. There are missing data for UK real gross domestic product (1947) and cinema attendance (1947-49 and 1995-99).
There are many factors that influence attendance besides income such as changes in the ticket price, changes in the quality of football, the effect of hooliganism and changes in taste. For example, Gaviria (2000), using a Markov switching regime, shows that English soccer switched into a low scoring state around 1965. In the high scoring state teams had a mean goal per season of 3.028 with a variance of 0.076, but in the low scoring state the mean was 2.600 with a variance of 0.010. The decline in the frequency of goal scoring may have contributed to the decline in attendance during the 1960s and 1970s. In the late 1980s hooliganism abated and soccer became more fashionable, which may partly explain the increase in attendance.

Time series studies include factors such as the ticket price, income and goals scored but they do not tend to capture the effect of taste or the impact of hooliganism on live attendance. Bird (1982) is the only study that includes a measure of hooliganism. A variable is set to zero from 1948 to 1965 and as a time trend thereafter, to reflect the increase in hooliganism. However, no justification is given for these dates and there may not have been the steady increase in hooliganism after 1965 that the time trend supposes. There is scope for disagreement over what dates would capture best the perception that attending soccer was unpleasant and dangerous. For example, in contrast with Bird (1982), Dobson and Goddard (2001, page 67) assert that hooliganism “returned with a vengeance in the mid-1950s”.
In column two the income elasticity is estimated including a hooliganism variable similar to that found in Bird (1982), notwithstanding the difficulties with this variable.\footnote{Hooliganism is modelled as a time trend beginning in 1965. The time trend increases by one unit per season until 1986 after which it decreases by one unit per season.} Comparing column one and two we can see that the income elasticity is sensitive to the treatment of hooliganism. This is yet a further reason to doubt time series estimates of the income elasticity.

For instance, the 1980s saw a dramatic increase in ticket price and a rise in income, as well as an apparent shift in tastes towards soccer and a decline in hooliganism. The increase in ticket prices and the rise in income, combined with the rise in attendance, taken on their own suggest that soccer is a normal good. Indeed Szymanski (2000) interprets these facts to mean that soccer has a positive income elasticity of demand. However we cannot make this conclusion. To properly assess the income elasticity all other explanatory variables must be held constant, including tastes and hooliganism. The coincidental shift in tastes towards soccer and the decline in hooliganism, rather than a positive income effect, may account for the rise in attendance after 1987.

The same reservations hold if we estimate the income elasticity for other UK leisure pursuits. Column three reveals the sign of the income elasticity of cinema admissions in four periods, using data from the European Cinema Yearbook and www.statistics.gov.uk. The fortunes of the British cinema industry mirror the soccer industry. Prior to 1977, cinema attendance appeared to be an inferior good since average income was rising and admissions falling. In 1950...
there were 1,395.8 million admissions to the cinema but admissions fell to an all
time low of 53.8 million by the mid-1980s. However after 1987 cinema attendance
appeared to be a normal good. In the late 1980s and 1990s admissions recovered.
In 1994 there were 124 million visits to the cinema.

The income elasticity of American sports seems less sensitive to the dates
under consideration than UK leisure pursuits. If we regress MLB attendance (from
the baseball archive at www.baseball1.com) against US real GDP (from
www.economic-indicators.com) and a strike dummy we find a positive income
elasticity in every period.\textsuperscript{12} This reflects the fact that the experience of MLB
contrasts sharply with the UK sporting experience. MLB attendance increased
steadily after the war. In 1999 MLB attendance was 3.5 times higher than in 1947.

There are also doubts over time series estimates of the ticket price
elasticity. As noted above there have been substantial swings in demand for live
soccer. If a model excludes tastes and the effect of hooliganism from the analysis
and the unobserved changes in taste and hooliganism coincide with changes in the
admission price, then this will bias the estimates of the ticket price elasticity. The
ticket price is likely to be endogeneous. Clubs may have exploited shifts in tastes
towards soccer by increasing the ticket price. This would make price endogeneous
and bias the ticket price elasticity.

In light of these difficulties pooled data are preferable to time series data
when estimating the ticket price and income elasticity. A pooled study is superior
to a time series analysis and a cross sectional analysis on the grounds that more data is better than less. However where pooled studies have been conducted in modelling soccer demand, methodological problems have generally undermined the results. For example, Baimbridge et al (1996) estimate a single attendance equation across all matches in the 1993-94 Premier League. In the process the study finds a positive ticket price elasticity. The positive coefficient is probably indicative of price endogeneity. Clubs tend to set their ticket price for the full duration of the season. As a result, most of the variation in the ticket price is across clubs rather than matches but large clubs tend to charge a higher price than smaller clubs. This gives rise to an apparent positive ticket price elasticity. Similarly, Dobson and Goddard (1992), Falter and Perignon (2000) and Peel and Thomas (1988), which are also pooled studies, exclude the price variable because, when an attempt is made to include the ticket price, the variable is insignificant or significant with a positive coefficient.

With appropriate econometric modelling it is possible to allow for fixed price effects. Garcia and Rodriguez (2002) allow for fixed price effects in a pooled study of the Spanish first division by using four instruments, including a club's capacity, to identify the ticket price. Instrumental variable estimation changes the ticket price elasticity changes from -0.295 to -0.968. Szymanski and Smith (1997) allow for fixed price effects using a system of equations consisting of an attendance equation, a supply equation representing the cost of buying player talent and an equilibrium condition.

Care also needs to be taken when interpreting the income elasticity from a pooled study. As Cairns (1990) points out, differences in income over time may have a different effect on attendance than differences in income between places at a point in time. For example, suppose that one soccer club which is located in a poor area has a higher attendance than a second club which is located in an affluent area, at a given point in time and holding all other factors constant. Furthermore assume that attendance increases at both clubs over time as general incomes rise. The fact that attendance is higher in the poorer area at a given point in time suggests that attendance is an inferior good. However the rise in attendance over time suggests that soccer is a normal good. There are two income effects – over time and at a point in time. A pooled study amalgamates the two income effects. Studies such as Baimbridge et al (1996) show no awareness of the distinction between the two species of income effect.

Previous estimates of both the ticket price and income elasticities are likely then to be biased. The estimates of the ticket price elasticity are likely to be biased downwards due to the omission of travel costs. Generic problems with the time series approach and problems with particular pooled studies may also have biased the ticket price and income elasticity estimates. These flaws may account for the puzzling estimates of the ticket price elasticity and the disagreement over the income elasticity for live soccer. The customary explanations for inelastic ticket pricing (complementary sales, TV revenue, crowding in and Becker's restaurant model) are not valid for soccer over the relevant time period.
Hence, to clarify the ticket price and income elasticities, a new approach for estimating the demand for live soccer is presented in chapter two. The approach gives due weight to travel costs and further it employs different type of data from the previous studies. Given the historical correlation between travel costs and the ticket price, we would expect the ticket price elasticities from the travel cost model to be significantly higher than the previous estimates.
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Chapter 3: A new approach for estimating the demand for live soccer

The model that we shall use to estimate the demand for live soccer is called the zonal travel cost model. It was first conceived by Hotelling (1947), in a letter to the Director of the US National Parks, as a way of valuing a park's recreational value. The Director did not act on Hotelling's suggestion, so it was left to Clawson (1959), Knetsch (1964) and Clawson and Knetsch (1966) to devise and popularise the method. The model has been applied to a wide range of environmental sites and market produced goods. For example, Benson and Willis (1990) used the model to estimate the consumer surplus from recreational activities at UK Forestry Commission estate. Forrest et al (2000) used it to estimate the ticket price elasticity and consumer surplus for a regional repertory theatre. Aylen (1978) applied the model to an historic building and Anex (1995) used it to estimate the demand for private hazardous waste disposal services.

The model is called the zonal travel cost method because it involves dividing the catchment area of a site into zones. An example of this is given in figure 3.1 for a hypothetical site. Everyone living in a zone is assumed to have the same average travel cost to a site. For example persons A and B are assumed to have the same average travel cost to the site as they live in the same ring but person C, who lives further away from the site, has a higher travel cost. Concentric rings are the most popular type of zone since travel costs are likely to increase in a radial manner away from the site, although other forms of zones are sometimes used. For example, Strong (1983) and Rosenthal (1987) divided the catchment area
of an environmental site according to county boundaries.

**Figure 3.1: Catchment area of a site**

The demand for a site is measured by the number of visitors (per unit of time) in a particular zone divided by the zone's population. It is necessary to divide by the population to allow for the fact that one zone may generate more visitors than another zone simply because it has a greater population. The zonal visitor rate is assumed to be a function of a zone's travel costs to the site, consisting of direct costs plus time costs, a measure of a zone's income and/or other characteristics and its travel costs to rival sites.

The first applications of the zonal model tended to omit time costs and considered only direct costs (e.g. Clawson and Knetsch 1966) but this changed following work by Cesario (1976) and McConnell and Strand (1981). These authors showed the importance of including travel time in the model. Time has a value and to ignore it in the cost of visiting a recreational site is to invite serious
error in measurement of demand. On-site time is also sometimes included as part of the total visit cost. For example, Fix and Loomis (1997) and Smith, Desvousges and McGivney (1983) augment total visit costs by on-site time. Rosenthal (1987) stressed the importance of including substitution effects since environmental sites can be very close substitutes. For example, two hiking trails may be equally attractive. This intensifies the substitution effects.

A demand curve relating attendance to the admission price is derived by assuming that travel cost effects perfectly duplicate admission price effects. That is, people react to changes in a site's admission price in the same way as if travel costs to the site had increased by the same amount in every zone, holding all other factors constant. For example, suppose that the admission price is zero and the corresponding attendance is known. This gives one point on the demand curve. Then suppose that the ticket price increases to £2. This is assumed to have the same effect on total attendance as an increase in travel costs by £2 in every zone. Estimating the new level of attendance (summed across all of the zones) and plotting it against a price of £2 gives a second point on the demand curve. Repeating the same procedure for further changes in the admission price traces out the entire curve. Clawson and Knetsch (1966) and Willis (1980) give more detailed numerical examples than this of the derivation of a demand curve.13 14

13 The travel cost model is not the only way of estimating a demand curve for an environmental site. For example, the Hedonic Pricing Method determines the value of a site by examining its impact on local house prices controlling for other factors. A full discussion of the various ways of valuing environmental sites can be found in Turner, Pearce and Bateman (1994).

14 This procedure yields an ordinary demand curve rather than an Hicksian demand curve. An ordinary demand curve reflects the income and substitution effect of a price change whereas an (unobservable) Hicksian demand curve reflects only the substitution effect. The traditional travel cost literature emphasises that the zonal travel cost model does not generate a Hicksian demand curve since the aim of the exercise is usually to estimate a site's consumer surplus and only a
The potential benefits from applying the zonal model to a soccer club are immediately apparent. The zonal model generates a demand curve and travel costs are at the core of the model. Indeed a demand curve is derived by assuming that travel cost effects duplicate admission price effects. Therefore the zonal model would allow us to estimate ticket price and income elasticities for soccer attendance while incorporating travel costs in the model in contrast with previous studies on the demand for live soccer, which ignore travel costs.

In the previous chapter it was shown how the ticket price is likely to be endogeneous in time series studies (due to long term shifts in tastes) and in particular pooled studies (due to inappropriate econometric modelling). The travel cost model also has the advantage over previous studies in terms of price endogeneity. Price has two components in the travel cost model: the ticket price and the travel costs. The cost of travelling to a game is likely to be exogeneous. Proximity to a stadium is unlikely to influence residential location. In principle, a fan could move house to be near his club but the average fan is more likely to base his residential location on his place of work than proximity to a stadium. This is particularly true considering that a fan will watch his team play at most twenty times in the season but he will work in the same place for nearly two hundred and fifty days per year.

It is less clear whether the ticket price element is endogeneous. For

Hicksian demand curve provides a true measure of welfare given non-zero income effects. However, this is not a matter of concern here as our purpose is not to estimate the consumer surplus.
example, a person may only buy a season ticket if they can be assured of going to most of the home games. This feat is more likely the nearer that one lives to a soccer ground. If so, then there is a positive relationship between distance from a stadium and the ticket price. That is the ticket price is endogenous. However there may also be a negative relationship between distance travelled and the ticket price. Non-season ticket holders may live further from the ground and to compensate for high travel costs opt for the lowest price ticket. Then again, if a trip to a soccer match is a rare occasion, non-season ticket holders may treat themselves and purchase the most expensive ticket.

Nevertheless price endogeneity is less likely in the travel cost model than in the previous types of study since travel costs are likely to be exogeneous and these form the core of model. Long term shifts in tastes which give rise to price endogeneity in time series studies are not a factor in the travel cost model since it employs cross sectional data. The zones serve as units of observation but the zonal visitor rate, travel costs and income etc are measured at a point in time. In addition the travel cost model is applied to one club at a time, so fixed price effects which are a feature of pooled studies such as Baimbridge et al (1996) are absent from the travel cost model.

There are differences between trips to an environmental site and trips to a soccer match, so the standard zonal model will need to be modified before it can be applied to a soccer club. A high proportion of visitors to an environmental site tend to engage in multi-purpose trips, derive utility from the journey or even move
house to be near the site. For example, in one application of the travel cost model, Haspel and Johnson (1982) found that seventy one percent of visitors to Bryce Canyon in America also visited the Zion National Park (a multi-purpose trip). A visitor to an environmental site is likely to enjoy the trip especially if it is through surroundings similar to the final destination.

As a result, traditional applications adjust travel costs. The zonal travel cost model assumes a standard visitor. Travel costs are assumed to be exogenous, so a visitor does not move house to be near a site. The standard visitor also does not derive any pleasure from the trip and the visit to the site is supposed to be the sole purpose of the trip. When this is not the case, travel costs do not accurately represent the recreational value of a site and they should be adjusted accordingly. The usual response to visitors who enjoy a trip is to set the opportunity cost of travel time to zero. For example, Hanley and Ruffell (1993) attribute all of the standard opportunity cost of travel time to standard visitors and none to respondents who claimed to have enjoyed the trip.\textsuperscript{15} If visitors move house to be near a site, travel costs underestimate a site’s recreational value and should be revised upwards. In the case of multi-purpose trips, travel costs should be allocated among the various sites, perhaps on the basis of a questionnaire.

However, no such adjustments are needed for soccer fans. A soccer fan fits the description of the standard visitor more closely than the visitor to an environmental site. As previously noted, the average fan is unlikely to base his

\textsuperscript{15} If the trip is itself a source of utility, it might be argued that travel time should be attributed a negative rather than a zero value.
residential location on proximity to a stadium. Fans are unlikely to derive pleasure from the journey since most clubs are located in inner city areas. The journey to a soccer match is often beset by traffic congestion and it is a quite distinct experience from the time spent watching the game. The short distance that fans travel to a soccer match relative to the distance travelled to the typical environmental site diminishes the probability of a multi-purpose trip among soccer fans since, as Vaughan, Russell and Hazilla (1982) point out, multi-purpose trips are more prevalent if visitors travel a great distance to a site.

Another difference between trips to an environmental site and trips to a soccer match concerns the ticket price. Entry is often free to environmental sites or else is a fixed amount; but soccer clubs charge an admission price and there are different price levels in different parts of the stadium. Further clubs charge different prices to season ticket holders and non-season ticket holders. So in this application, the ticket price is explicitly included in the model. The club's average ticket price is added to own travel costs in each zone, thereby giving the composite price of attending a soccer match. With the aid of empirical data we can decide whether the ticket price should be treated as a constant or whether it should vary from zone to zone.

It is also necessary to modify the model's dependent variable. In the standard zonal model, demand is measured by a visitor rate (the number of visitors in a zone divided by the population). However for a soccer club it would be better to measure demand by the number of ticket sales in a zone divided by the
population. To see the advantage of using ticket sales per capita rather than the number of fans per capita suppose that an individual fan moves from an inner zone to an outer zone. As a result he attends twelve home games per season rather than the initial nineteen home games due to the higher travel costs. The visitor rate would not change as the fan is still attending. Only the visit rate would capture the change in demand.

Most soccer clubs are named after the place where they are located. Dobson and Goddard (1996) refer to the "obvious importance of location as a defining characteristic of the "product" supplied by football clubs" (page 444) and "the strong geographical element in the story of the historical development of professional football" (page 451). The importance of location rather than the influence of travel costs may account for much of the decline in a club's ticket sales with distance from its stadium; people who live in the vicinity of a club may have a stronger affinity for the club than people who live further away. We allow for this by including a measure of a zone's affinity for a club in the model. Without an affinity variable, the travel cost effect would be over-stated. Allowing for the affinity effect represents a new development in the travel cost approach. Traditional applications do not include an affinity variable, presumably because tribal loyalty based on a sense of place maybe less strong in connection with an environmental amenity than for a soccer club.

The final difference of note between a trip to an environmental site and a soccer match concerns on-site time. The amount of time that visitors spend at an
environmental site tends to vary with distance from the site. For example, one person living nearby may spend a few hours at a national park. Another person living further away may take a longer vacation, perhaps lasting weeks. However the amount of time that soccer fans spend at a stadium tends not to vary greatly across fans. A soccer match has a fixed duration of ninety minutes (plus half time). Some fans may arrive early before a game, others may stay behind after a game, but on average fans spend the same amount of time at a stadium irrespective of their zone of origin.\footnote{This is perhaps because pre-match entertainment is very limited.}

As a result on-site time is omitted from our model. Fix, Loomis and Eichorn (2000) and Ward (1984) both demonstrate that, if visitors substitute longer on-site time for fewer annual visits as travel costs increase, excluding on-site time biases the travel cost coefficient upwards. As a result they recommend that on-site time should be included as part of the total visit cost. However omitting constant on-site time does not bias the travel cost coefficient in the case of a soccer match since total visit costs are reduced by the same amount for every zone; the slope of the demand curve is not affected.

Thus our modified travel cost model looks as follows. The dependent variable is the per capita number of home tickets bought in a season from zone \( i \) (\( \text{TICKETS}_i \)). This depends upon the zone's generalised cost (\( \text{GENCOST}_i \)), consisting of travel costs and the ticket price, and upon a measure of the degree of commitment to a club in a zone (\( \text{AFFINITY}_i \)). Ticket sales per capita are also a function of a zone's income (\( \text{INCOME}_i \)). In some ways it is easier to apply the
zonal travel cost model to soccer clubs than in the traditional setting. With soccer clubs it is not necessary to adjust travel costs for non-standard visitors and on-site time can be omitted. However, in other ways soccer events pose a new challenge for the travel cost method. The fan's strong sense of place means that the model must include an affinity variable, thereby increasing the model's already considerable data requirements.

\[
\text{TICKETS}_i = f(\text{GENCOST}_i, \text{AFFINITY}_i, \text{INCOME}_i)
\]

The modified model fits the archetypal demand function. Sales depend upon a composite price, a measure of tastes and income. The price of substitute goods is the only variable which is missing that we might expect to see in a demand function. However substitution effects are omitted due to the zonal framework. It is not possible to measure travel costs to rival sites at the zonal level. For example, it is not clear from which side of the ring the travel costs should be measured. Travel costs measured from one side of a ring may be substantially different from travel costs measured from the opposite side of the ring. It is also not clear what constitutes a substitute site. For some fans, there may be no substitute to "their" club. The clubs have strong brand loyalty in spite of the differentiation in terms of the team's quality. However, among floating fans, other soccer clubs or leisure activities may serve as legitimate substitutes.

Omitting substitution effects may bias our other coefficients. If the clubs face no external competition for primary soccer supporters, then there is no bias.
However, there may be a bias if there are rival sites. We shall return to this issue later. As we shall see the direction of the bias depends upon the existence of rival sites and their spatial distribution. My inclination is that there is limited competition for primary soccer supporters and thus the bias is insignificant. The number of floating spectators is likely to be small relative to the number of spectators that are loyal to a particular club at a particular point in time.\textsuperscript{17} In addition the Football League and Premiership intentionally minimise fixture clashes between local clubs. These factors mean that the clubs are likely to face limited external competition from other soccer clubs. Competition from other leisure activities is likely to be limited because many other activities tend to take place outside the soccer season (August to May) and moreover they are not likely to be specific to one soccer club or game in a season.\textsuperscript{18} On the positive side there is a potential benefit from excluding substitution effects. It may improve the efficiency of the model. Excluding travel costs to other sites increases the model’s number of degrees of freedom (the number of observations minus the number of explanatory variables).

A demand curve is obtained, as in the standard zonal model, by assuming that travel costs effects perfectly duplicate admission price effects. Following Forrest et al (2000), the ticket price elasticity is given by the partial derivative of ticket sales with respect to generalised costs (assumed to be the same as the

\textsuperscript{17} Over several years, clubs probably compete for committed fans, e.g. new entrants (teenagers) may choose between several possible clubs that they could support. But in any one season, most primary fans will be committed to their team and are unlikely to regard attendance at games not involving their team as a remotely adequate substitute.

\textsuperscript{18} For example, English cricket is played only during the summer and rugby league changed to a summer season in the mid-1990s.
derivative with respect to the ticket price) multiplied by the prevailing ticket price divided by total ticket sales. We would expect an optimal ticket price elasticity of unity, whether or not a club is a local monopolist. In order for profits to be maximised at the point where demand is unit elastic we require only that the club has some discretion over its ticket price, that is that the club has a downward sloping demand curve. The income elasticity of the demand for live soccer is taken to be positive if zones with a higher mean income have a higher ticket sales per capita than lower income zones, holding other factors constant. However the income elasticity is negative if ticket sales per capita decline with increases in zonal income, holding other factors constant.

The model's dependent variable, ticket sales per capita, encompasses only home supporters. However, previous studies on the demand for live soccer estimate attendance by home supporters plus away supporters. In addition a population measure to reflect market size or catchment area is often included as an explanatory variable. However these differences in the dependent variable are not a matter for concern. Home supporters form the overwhelming majority of the crowd, so it is legitimate to focus on attendance by home supporters. Furthermore, the important point when estimating the elasticities is that all other factors are held constant. Including the population either as an explanatory variable or in the calculation of the dependent variable holds the population constant.

The previous studies on soccer hypothesise that attendance is influenced by outcome uncertainty, a team's quality and playing performance. However it is not
necessary to include these factors in the zonal model since perceptions of a team's quality, playing success and outcome uncertainty are likely to be the same in every zone regardless of where a fan lives. Outcome uncertainty can also be omitted because it affects attendance at the match level, while here we are concerned with total ticket sales over the season.

One of the disadvantages of the zonal travel cost model is the small number of observations. The small number of observations limits the number of explanatory variables that can be included in the model. In response, Brown and Nawas (1973) proposed using individual observations rather than zonal observations. The number of individual visitors to a site is greater than the number of zones, so using individual observations should improve the efficiency of the estimates. For example, Brown and Nawas (1973) estimated the demand for the North East Oregon big game resource based on thirty one zones. The same function was also fitted to two hundred and forty eight individual observations. Estimates based on the individual observations had significantly lower standard errors than estimates from the zonal model. Thus the gains in efficiency from using the individual model can be substantial, although this is not guaranteed. In subsequent work, Brown, Sorhus, Chou-Yang and Richards (1983) show that, in the event of measurement errors, the zonal model may be more efficient than the individual model: zonal averaging reduces the variance of the measurement errors.

The zonal model and the individual model are generally the same except for the different type of observations. In the individual model, the dependent
variable is the number of trips that an individual visitor makes to a recreational site during the season. This is assumed to depend upon an individual's total generalised visit cost consisting of travel costs plus possibly the admission price and on-site time. Other variables may include the vector of total visit costs to substitute sites and individual specific variables like a person's age and income. As in the zonal model, a demand curve is derived by assuming that travel cost effects perfectly duplicate admission price effects.

The individual model can be derived from standard consumer theory (e.g. Smith (1989) and Douglas and Taylor (1999)). The derivation assumes that an individual obtains utility from visits to recreational sites, and from the consumption of market produced goods. The individual decides how many times to visit each site during the season so as to maximise utility. However the individual's choice is constrained by income and time. The income constraint says that all of the individual’s income is spent at the constrained optimum either on marketed goods or on travelling to the recreational site and paying admission fees. The time constraint says that the time that is spent consuming marketed goods, travelling to the site and on-site is not available for work. In the time constraint, the individual’s maximum income equals the wage rate times the number of hours worked plus a non-wage income. Maximising the individual’s utility function subject to the income constraint and time constraint yields the individual travel cost model. In the derivation, the individual's utility function is assumed to have all the desired properties, namely that the utility function $U$ is monotonically increasing, strictly concave and bounded from below so $U(0)=0$. It is also
continuous, has continuous first and second order derivatives, is unbounded from above and the law of diminishing marginal utility holds for visits to a recreational site.

At first sight it may seem that the individual travel cost model should be used in preference to the zonal model to estimate the ticket price and income elasticities of the demand for live soccer. The estimates of the elasticities should be more efficient (i.e. have lower standard errors) using the individual model. However we need to consider the matter in more detail before making this judgement. When there is a change in the ticket price (or income) there are two ways in which attendance can change. First, current visitors may alter their frequency of attendance in light of the new ticket price (income). Second non-participants who did not use a site before may begin attending. A complete measure of the ticket price elasticity (or income elasticity) must capture both reasons for a change in attendance.

In the individual travel cost model, demand is truncated at one visit (non-participants are excluded). Therefore if we were to estimate the ticket price elasticity or the income elasticity using the individual travel cost model, it would show only the responsiveness of current visitors to change in the ticket price or income. The effect on non-participants would be overlooked. This is in contrast with the zonal model of a soccer club. The dependent variable in the zonal model is the number of visits divided by the zonal population. Most of the population does not frequent a site, so the spatial model implicitly captures both reasons for a
change in attendance.

We require a complete measure of the ticket price elasticity and income elasticity. Therefore the zonal model is used in preference to the individual model as only the zonal model can provide a complete elasticity. The modified zonal model (which allows for the peculiarities of a soccer match) is estimated in the subsequent chapters. However the individual model is not completely overlooked. Towards the end of the thesis we shall explore ways in which the individual model can be utilised to improve the efficiency of the initial findings.
References


Chapter 4: Data requirements

The data requirements of the modified zonal travel cost model are considerable. To apply the model we first need to divide the catchment area of a soccer club into zones. Given the zonal structure, we then need to construct a measure of the travel cost from each zone. It is also necessary to obtain a measure of a club’s ticket price. The final items of data that we need are data on the commitment to a club for each zone, per capita ticket sales in each zone and data on a zone’s mean income.

Most of the data requirements will be met using data from the 1995/96 F.A. Premier League National Fan Survey. The Survey is conducted on an annual basis by the Sir Norman Chester Centre for Football Research, located at the University of Leicester. In addition we shall use data from the 1991 Census, which is a rich source of data on the social and economic characteristics of geographical areas in Great Britain.

The 1995/96 National Fan Survey is an ideal source of data due to its large size. According to Williams (1996) it is the largest survey of soccer fans in the world. It also has the advantage that many of the questions in the survey are relevant to our model. A full copy of the questionnaire is included in appendix one and a summary of the survey returns is given in table 4.1.
<table>
<thead>
<tr>
<th>CLUB</th>
<th>Q'naires for season ticket holders (STH)</th>
<th>Q'naires for non season-ticket holders</th>
<th>STH returns</th>
<th>Non STH returns</th>
<th>% response rate STH</th>
<th>% response rate non STH</th>
<th>Total returns (STH+NSTH+unknowns)</th>
<th>Total response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenal</td>
<td>2000</td>
<td>1000</td>
<td>950</td>
<td>238</td>
<td>47.5</td>
<td>23.8</td>
<td>1194</td>
<td>39.8</td>
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<tr>
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<td>2000</td>
<td>1000</td>
<td>1058</td>
<td>227</td>
<td>52.9</td>
<td>22.7</td>
<td>1300</td>
<td>43.3</td>
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<td>2.8</td>
<td>867</td>
<td>28.9</td>
</tr>
<tr>
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<td>1000</td>
<td>749</td>
<td>145</td>
<td>37.5</td>
<td>14.5</td>
<td>906</td>
<td>30.2</td>
</tr>
<tr>
<td>Chelsea</td>
<td>2000</td>
<td>1000</td>
<td>876</td>
<td>204</td>
<td>43.8</td>
<td>20.4</td>
<td>1088</td>
<td>36.3</td>
</tr>
<tr>
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<td>1000</td>
<td>834</td>
<td>204</td>
<td>41.7</td>
<td>20.4</td>
<td>1053</td>
<td>35.1</td>
</tr>
<tr>
<td>Everton</td>
<td>2000</td>
<td>1000</td>
<td>875</td>
<td>36</td>
<td>43.8</td>
<td>3.6</td>
<td>914</td>
<td>30.5</td>
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<tr>
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<td>34.8</td>
<td>6.0</td>
<td>759</td>
<td>25.3</td>
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<tr>
<td>Liverpool</td>
<td>2000</td>
<td>1000</td>
<td>711</td>
<td>191</td>
<td>35.6</td>
<td>19.1</td>
<td>909</td>
<td>30.3</td>
</tr>
<tr>
<td>Man. City</td>
<td>2000</td>
<td>1000</td>
<td>972</td>
<td>79</td>
<td>48.6</td>
<td>7.9</td>
<td>1056</td>
<td>35.2</td>
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<tr>
<td>Man. United</td>
<td>2000</td>
<td>1000</td>
<td>761</td>
<td>178</td>
<td>38.1</td>
<td>17.8</td>
<td>943</td>
<td>31.4</td>
</tr>
<tr>
<td>Middlesb.</td>
<td>1310</td>
<td>690</td>
<td>574</td>
<td>99</td>
<td>43.8</td>
<td>14.3</td>
<td>679</td>
<td>34.0</td>
</tr>
<tr>
<td>Newcastle U.</td>
<td>2000</td>
<td>-</td>
<td>882</td>
<td>-</td>
<td>44.1</td>
<td>-</td>
<td>882</td>
<td>44.1</td>
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<tr>
<td>Nott. Forest</td>
<td>2000</td>
<td>1000</td>
<td>828</td>
<td>52</td>
<td>41.4</td>
<td>5.2</td>
<td>887</td>
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<tr>
<td>QPR</td>
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<td>1000</td>
<td>846</td>
<td>41</td>
<td>42.3</td>
<td>4.1</td>
<td>894</td>
<td>29.8</td>
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<td>1000</td>
<td>1054</td>
<td>255</td>
<td>52.7</td>
<td>25.5</td>
<td>1320</td>
<td>44.0</td>
</tr>
<tr>
<td>Southampton</td>
<td>2000</td>
<td>1000</td>
<td>1106</td>
<td>425</td>
<td>55.3</td>
<td>42.5</td>
<td>1535</td>
<td>51.2</td>
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<tr>
<td>Tottenham H.</td>
<td>2000</td>
<td>1000</td>
<td>895</td>
<td>343</td>
<td>44.8</td>
<td>34.3</td>
<td>1245</td>
<td>41.5</td>
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<tr>
<td>West Ham</td>
<td>2000</td>
<td>1000</td>
<td>818</td>
<td>228</td>
<td>40.9</td>
<td>22.8</td>
<td>1051</td>
<td>35.0</td>
</tr>
<tr>
<td>Wimbledon</td>
<td>2000</td>
<td>1000</td>
<td>895</td>
<td>93</td>
<td>44.8</td>
<td>9.3</td>
<td>997</td>
<td>33.2</td>
</tr>
</tbody>
</table>

| Total        | 39310                                  | 18690                                 | 17216       | 3126            | 43.8%                | 16.7%                  | 20479                            | 35.3%             |
The Survey involved distributing 58,000 questionnaires to the fans of the 1995/96 season's twenty Premier League clubs. To reflect the composition of the average home gate, 2000 questionnaires were distributed to season ticket holders at each club and 1000 to non-season ticket holders. The only exceptions were Newcastle United and Middlesbrough. Both clubs had all season ticket stadiums, so their fans received only 2000 questionnaires. A total of 20,479 questionnaires (35.3%) were returned across all of the clubs, ranging from 1535 questionnaires (51.2%) at Southampton to 679 questionnaires (34.0%) at Middlesbrough. The Centre for Football Research distributed the questionnaires to season ticket holders on a random basis using mailing lists provided by the clubs, whilst the club ticket offices contacted non-season ticket holders.

There are two questions in the 1995/96 Survey relating to the distance that fans travel to a soccer match, which we may use to allocate fans into zones. At the end of the Survey fans were asked for their postcode and in question 8a fans were asked to estimate how far they lived from their home ground. Both give an indication of the travel distance to a soccer match. Each postcode has its own unique ordnance survey co-ordinates (recovered using the 1995 issue of the Post Office Central Postcode Directory at the Manchester Computing Centre). Given the ordnance survey co-ordinates of a club and a fan’s home, it is then possible to calculate the straight-line distance between the two points using Pythagoras’ Theorem.

The straight-line distance is preferred to the reported distance, in the sense
that the straight-line distance is objective while the reported distance is subjective, and therefore may be unreliable. However, it may be argued that it is impossible for fans to travel in a straight-line to a soccer match due to the circuitous road network. In this case, the reported distance would be more suitable than the straight-line distance. When coding the responses to the survey, the Centre for Football Research recorded the responses to all of the questions except the postcodes. As a result the reported distances are used as a way of allocating fans into rings.

However before employing the reported distances we must first test their reliability against a more objective measure of distance. The test involves estimating the following distance regression for each club:

\[ RDISTMIL = B_0 + B_1 \cdot VDISTMIL \]

RDISTMIL is the fan's reported distance from question 8a and VDISTMIL is the corresponding straight-line distance from a 20% sub-sample of postcodes. Although the Centre for Football Research did not code the postcodes, the present author was able, during a week at Leicester, to code postcodes for this sub-sample. Using the sub-sample of postcodes we can test the reliability of the reported distances, but the sub-sample is not sufficiently large to use the straight-line distance in the analysis below.

If the reported distances are reliable, then the straight-line distances
(VDISTMIL) should explain a high proportion of the total variation in the reported distances (RDISTMIL). The coefficient $B_1$ should also be greater than unity due to the circuitous road network. The constant $B_0$ can be perceived as the distance that is common to all journeys, such as the area immediately around a ground that all fans must navigate.

The results, which are given in table 4.2, show that the equation has a high goodness of fit at all of the clubs (a mean $R^2$ of 94%) and the coefficient $B_1$ is significantly greater than unity at all of the clubs at a 1% level. The constant $B_0$ is significantly different from zero at eight clubs at the 5% level. A pooled regression shows that, on average, fans’ reported distance exceeds their straight-line distance by 28% (plus a constant 0.8 miles), which, from casual observation, seems a reasonable result. Based on these results we can conclude that the reported distances are sufficiently reliable to allocate fans into rings.

The reported distances in the Fan Survey are clustered around intervals of five miles. To allow for this, the rings are drawn around multiples of five miles. The number of respondents falls with distance from the stadium. Consequently the outer rings are drawn wider than the inner rings in order to capture an adequate number of fans in each ring. The innermost ring has a radius of 7.5 reported miles. This is followed by a further seven rings, each of five mile radius, up to 42.5 miles from the stadium. Four additional rings are added at 52.5, 62.5, 82.5 and 102.5

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19 The reported distances show less variation than the straight-line distances, which results in heteroskedasticity. To correct for the heteroskedasticity I used White’s heteroskedastic consistent standard errors.
### TABLE 4.2 : OLS DISTANCE REGRESSIONS

RDISTMIL = $B_0 + B_1 \cdot VDISTMIL$

<table>
<thead>
<tr>
<th>CLUB</th>
<th>N</th>
<th>$B_0$</th>
<th>$T_{B0=0}$</th>
<th>$B_1$</th>
<th>$T_{B1&gt;1}$</th>
<th>RBAR$^2$</th>
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<tr>
<td>Arsenal</td>
<td>204</td>
<td>-0.986</td>
<td>-0.474</td>
<td>1.337</td>
<td>2.741***</td>
<td>0.909</td>
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<tr>
<td>Aston Villa</td>
<td>224</td>
<td>1.006</td>
<td>2.480**</td>
<td>1.209</td>
<td>3.755***</td>
<td>0.943</td>
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<tr>
<td>Blackburn R.</td>
<td>150</td>
<td>-0.612</td>
<td>-1.999**</td>
<td>1.495</td>
<td>16.551***</td>
<td>0.974</td>
</tr>
<tr>
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<td>159</td>
<td>1.155</td>
<td>1.264</td>
<td>1.343</td>
<td>11.138***</td>
<td>0.941</td>
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<td>0.073</td>
<td>0.081</td>
<td>1.300</td>
<td>5.295***</td>
<td>0.934</td>
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<tr>
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<td>184</td>
<td>0.676</td>
<td>1.159</td>
<td>1.274</td>
<td>4.280***</td>
<td>0.928</td>
</tr>
<tr>
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<td>159</td>
<td>0.729</td>
<td>1.321</td>
<td>1.324</td>
<td>5.570***</td>
<td>0.977</td>
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<tr>
<td>Leeds</td>
<td>127</td>
<td>1.630</td>
<td>1.743*</td>
<td>1.196</td>
<td>2.818***</td>
<td>0.960</td>
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<td>Liverpool</td>
<td>134</td>
<td>0.357</td>
<td>0.209</td>
<td>1.384</td>
<td>4.112***</td>
<td>0.899</td>
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<td>Man. City</td>
<td>180</td>
<td>1.296</td>
<td>3.691***</td>
<td>1.295</td>
<td>11.913***</td>
<td>0.988</td>
</tr>
<tr>
<td>Man. United</td>
<td>152</td>
<td>1.717</td>
<td>1.356</td>
<td>1.242</td>
<td>2.668***</td>
<td>0.931</td>
</tr>
<tr>
<td>Middlesbr.</td>
<td>114</td>
<td>1.266</td>
<td>2.843***</td>
<td>1.165</td>
<td>3.064***</td>
<td>0.983</td>
</tr>
<tr>
<td>Newcastle U.</td>
<td>156</td>
<td>1.071</td>
<td>5.031***</td>
<td>1.181</td>
<td>10.526***</td>
<td>0.988</td>
</tr>
<tr>
<td>Nott. Forest</td>
<td>150</td>
<td>0.611</td>
<td>1.041</td>
<td>1.215</td>
<td>3.266***</td>
<td>0.922</td>
</tr>
<tr>
<td>QPR</td>
<td>142</td>
<td>1.055</td>
<td>2.785***</td>
<td>1.205</td>
<td>8.787***</td>
<td>0.977</td>
</tr>
<tr>
<td>Sheffield W.</td>
<td>234</td>
<td>1.903</td>
<td>2.632***</td>
<td>1.237</td>
<td>6.779***</td>
<td>0.922</td>
</tr>
<tr>
<td>Southampton</td>
<td>273</td>
<td>0.587</td>
<td>1.003</td>
<td>1.250</td>
<td>5.339***</td>
<td>0.969</td>
</tr>
<tr>
<td>Tottenham H.</td>
<td>224</td>
<td>2.269</td>
<td>5.255***</td>
<td>1.230</td>
<td>10.600***</td>
<td>0.965</td>
</tr>
<tr>
<td>West Ham</td>
<td>175</td>
<td>0.327</td>
<td>0.617</td>
<td>1.322</td>
<td>8.417***</td>
<td>0.935</td>
</tr>
<tr>
<td>Wimbledon</td>
<td>168</td>
<td>0.196</td>
<td>0.544</td>
<td>1.295</td>
<td>9.132***</td>
<td>0.960</td>
</tr>
<tr>
<td>Pooled</td>
<td>3482</td>
<td>0.804</td>
<td>3.541***</td>
<td>1.275</td>
<td>15.157***</td>
<td>0.943</td>
</tr>
</tbody>
</table>

*** denotes significance at the 1% level, ** at the 5% level and * at the 10% level
miles. The outer boundary is set so as to capture 95% of respondents. An outer boundary of 102.5 reported miles is appropriate at fifteen clubs. However in the case of Liverpool a further three rings with boundaries at 122.5, 162.5 and 202.5 reported miles are required to catch 95% of respondents. Furthermore, the ring 62.5 to 82.5 reported miles is divided, in the case of Liverpool, into two rings of equal size due to the large number of fans in that particular ring. Blackburn Rovers, Bolton Wanderers, Newcastle United, and Middlesbrough require only ten rings to enclose 95% of respondents, so in the case of these clubs the radius of the outer boundary is 62.5 reported miles.

Given this zonal ring structure, we can now calculate data for the model's four variables \( \text{TICKETS}_i \), \( \text{GENCOST}_i \), \( \text{AFFINITY}_i \) and \( \text{INCOME}_i \) (as defined in chapter three). All of the previous studies on the demand for live soccer, (with the exception of Simmons (1996)), group season ticket and non-season ticket holders together.\(^{20}\) To preserve comparability with these studies, we shall also combine the responses from season ticket holders and non-season ticket holders when calculating data for the model's variables.

The dependent variable \( \text{TICKETS}_i \) is defined as the total number of tickets bought by home fans during the 1995/96 season per 100 people living in the \( i^{th} \) zone, where \( i=1,2...,n \) (at the typical club \( n \) is 12). It is determined using information on the frequency of home attendance from question 1a in the 1995/96

\(^{20}\) Simmons (1996) estimates two attendance equations: i) grouping season ticket holders and non-season ticket holders together and ii) solely for non-season ticket holders. The ticket price elasticities for Simmons (1996) in table 2.1 are for all fans (case i). The ticket price elasticities for non-season ticket holders tend to be more elastic than the values reported in table 2.1.
Survey combined with the reported distance (which is used to place the fans into zones) from question 8a. First, we estimate the total number of home tickets sold during the 1995/96 season. A club’s total ticket sales is taken at the difference between the club’s average home attendance for the 1995/96 season and the average away-fan allocation (from the Rothman’s Football Yearbook and Ladd (1996) respectively), multiplied by the total number of home games in the season, inclusive of cup games. The next step is to distribute the total ticket sales between the zones of a club, based on the inter-zonal ticket sale proportions from question 1a (assuming that the sample proportions are representative of all fans).

Question 1a asked fans how many home games they attended in a season: “1-2” home games, “3-5”, “6-10”, “11-15”, “16-20” or “All” home games. Each response is represented by its mid-point. For example the response “6-10” home games is taken to mean eight games. The response “All” home games is taken to mean nineteen home Premier League games plus any cup matches that were played at home. Finally, the total number of ticket sales in each zone is multiplied by 100 and the answer is then divided by the zonal population. This gives the dependent variable TICKETS.

As expected the value of the dependent variable falls with distance from the stadium. For example, in the case of Arsenal, an estimated 11.1 tickets were bought by home fans per 100 people within 7.5 reported miles of the club’s stadium. Between 7.5 and 12.5 reported miles, an estimated 8.8 tickets were bought per 100 people. In the ring 12.5 to 17.5 reported miles, an estimated 5.8
tickets were bought per 100 people during the 1995/96 season.

Estimating the zonal travel cost involves making a number of assumptions based on the 1995/96 National Fan Survey and data from the Department of Transport and the Automobile Association. First we assume that 69.8% of Premier League fans travel by car to their home matches and the other 30.2% of fans travel by public transport. A distinction is made between non-London clubs (e.g. Leeds United) and London clubs (e.g. Arsenal). The bus is taken as representative of all non-car modes of transport outside London and the tube is taken as the alternative to the car within London. These assumptions are based on the responses to question 8b. This shows that the car was the most popular means of transport: 69.8% of Premier League fans travelled by car to their home matches. The bus was the second most popular mode of transport outside London, whilst fans of London clubs preferred the London Underground after the car.

Opinion is divided on the best measure of car costs. For instance, Willis and Garrod (1991) adopt full car running costs in a traditional travel cost application but Sellar, Stoll and Chavas (1985) use petrol-only costs. For the moment we shall assume that motorists perceive full car running costs, although later, as part of a sensitivity test, we shall adopt petrol-only costs. Car running costs are taken as 14.19 pence per mile for a car with a median engine capacity in the 1401-2000 cc range (Automobile Association (April 1996)).

21 The A.A. classifies the private cost of motoring under two headings: standing charges and running costs. Standing charges are fixed charges that have to be paid whether a car is used or not (depreciation, insurance, road tax and A.A. membership) while running costs are mileage related (petrol, oil, tyres, routine servicing and repairs and replacement allowing for manufacturer
fare is taken as 23.2 pence per mile based on the "current price all tickets bus fare index" in *Bus Data 1998 edition*. The index is used to update the average bus fare per mile for English Metropolitan Areas (ordinary adult tickets) in *Bus and Coach Statistics Great Britain 1994/95* to a 1996 level. The standard tube fare is taken as 19.5 pence per mile for 1996, based on the *London Underground Directors' Report and Accounts for the Year Ended 31st March 1998*.

The above costs are adjusted in a number of ways. Question 9b shows that for fans travelling by car, the average group size was two people including the respondent, so car running costs are divided by two to give the cost per person. Such an adjustment is not necessary for the bus and tube since the fare is per person. The responses to questions 8b, 31a and 33a show that 28.1% of fans travelling by public transport were either younger than 15, a full time (adult) student or retired. Children, students and pensioners are often eligible for a discount on public transport, so it is assumed that 28.1% of bus and tube users receive a 50% discount on the standard fare (a 50% discount is deemed to be typical). Fans incur costs travelling to and from a soccer match, so all costs are multiplied by two to give the costs per mile of a return journey. Applying these adjustments gives an overall direct cost per mile of 21.95 pence in the case of the non-London clubs and 20.03 pence in the case of the London clubs.\(^{22}\)

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\(^{22}\) The overall direct cost per mile equals \((0.698*14.19 \text{ pence}^2/2) + (0.302* (0.281*0.5*23.2 \text{ pence}^2 + 0.719*23.2 \text{ pence}^2))\) at non-London clubs and \((0.698*14.19 \text{ pence}^2/2) + (0.302* (0.281*0.5*19.5 \text{ pence}^2 + 0.719*19.5 \text{ pence}^2))\) at London clubs.
The total cost of attendance includes a time cost as well as a direct cost since the time that a soccer fan spends travelling could be used in other ways. When calculating the time cost, various travel speeds are assumed. Near to a stadium the travel conditions are often comparable to peak time conditions, since fans converge on a soccer stadium before a game and they depart en masse after the soccer match (even though most matches take place at the weekend). However, further away from the stadium, fans are more dispersed and off-peak conditions are applicable. To allow for this variation, “peak time” travel speeds are applied within a radius of three straight-line miles of a club, excluding motorway travel for cars and buses. Most clubs are located in inner city areas so it is reasonable to assume that fans cannot use motorways in the immediate vicinity of a club. Beyond three miles from the club, “off peak” travel speeds are applied. The figure used is speed for “all roads” for cars; but the figure for buses excludes motorways.

A list of the relevant car speeds are given below. These are taken from Traffic Speeds in Central and Outer London 1996/7 and Road Traffic Speeds in English Urban Areas 1996/97. Both studies used the “floating car” technique to measure the traffic speeds after delays and congestion. In the floating car technique, a car is driven so as to achieve a balance between the number of vehicles overtaken by, and the number of vehicles overtaking, the survey car. The speeds are available for various Metropolitan areas. Each club is matched to the appropriate area in the traffic studies. Where there is no “excluding motorway speed” then the “all road speed” is used as the nearest estimate.
Table 4.3: Car Road Travel Speeds (mph)

<table>
<thead>
<tr>
<th>Area</th>
<th>Peak (&lt;3 miles)</th>
<th>Off-Peak (&gt;3 miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All roads Excl. mways</td>
<td>All roads Excl. mways</td>
</tr>
<tr>
<td>West Midlands</td>
<td>20.2</td>
<td>27.3</td>
</tr>
<tr>
<td>Greater Manchester</td>
<td>21.3</td>
<td>27.4</td>
</tr>
<tr>
<td>Leeds/Bradford</td>
<td>19.5</td>
<td>23.9</td>
</tr>
<tr>
<td>Tyneside</td>
<td>24.9</td>
<td>32.6</td>
</tr>
<tr>
<td>Merseyside</td>
<td>21.1</td>
<td>21.5</td>
</tr>
<tr>
<td>Sheffield</td>
<td>17.3</td>
<td>21.1</td>
</tr>
<tr>
<td>Nottingham</td>
<td>18.0</td>
<td>23.5</td>
</tr>
<tr>
<td>Teesside</td>
<td>29.0</td>
<td>35.0</td>
</tr>
<tr>
<td>Coventry</td>
<td>20.9</td>
<td>25.8</td>
</tr>
<tr>
<td>Southampton</td>
<td>18.6</td>
<td>24.4</td>
</tr>
<tr>
<td>All areas of London</td>
<td>16.6</td>
<td>19.1</td>
</tr>
</tbody>
</table>

To estimate bus speeds, we contacted the Greater Manchester Passenger Transport Executive. The Greater Manchester Passenger Executive advised that bus speeds are one third slower than car speeds in the Greater Manchester area (buses are slower since they must stop to allow passengers on and off). Greater Manchester consists of an urbanised area and a rural hinterland, so the adjustment for Manchester is likely to be applicable to the other areas. Therefore buses are assumed to travel a third slower than a car under all travel conditions and in all areas. In the case of the tube, we assume that the tube offers travel at a constant speed of 20.5 mph irrespective of distance. A speed of 20.5 mph is the average speed of a scheduled London Underground train including station stops, according to the London Underground website.

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23 It could be argued that this estimate is not suitable for areas of London. However, in London the principal method of public transport employed by fans was the underground, not buses.

24 [http://www.londontransport.co.uk/underground/t_fact02.htm](http://www.londontransport.co.uk/underground/t_fact02.htm) (8th April 2000).
Following travel cost applications by Forrest et al (2000) and Willis and Garrod (1991), time is valued at the Department of Transport’s standard behavioural value of non-work time as determined in the Department of Transport (1987). This value is appropriate for several reasons. First, because the journey to a soccer match is generally undertaken during leisure time, so the value of non-work time is appropriate. The standard behavioural value of non-work time also falls in the desired range between zero and the full wage rate. It corresponds to 51% of current hourly earnings. We would expect the value of non-work time to be less than the full wage rate as the market wage compensates for both leisure foregone and the disutility from work. It is fitting that the standard behavioural value is greater than zero, since for most fans the journey to a soccer match is a chore.

The standard behavioural value has the advantage of being an average value. It is applicable to all modes of transport and to the average user. There are special values of non-work time for children and pensioners but the Department of Transport recommends that they should be used only where users are almost entirely children or pensioners, which is not the case for the typical soccer crowd. It is important to use an average value since the purpose of the exercise is to determine the average travel cost in each zone.

The final point in favour of the standard behavioural value is that the Department of Transport uses it in a similar setting to the zonal travel cost model, to predict the effect of changes in travel time on the flow of traffic. This is comparable to the zonal travel cost model, which is concerned with the effect of
changes in travel time (across zones) on attendance. *Department of Transport (1997)* gives the standard behavioural value at 1994 wages. Updating the 1994 value to 1996 wages gives a standard behavioural value of 6.841 pence per minute.\textsuperscript{25} \textsuperscript{26}

As a means of illustrating how the travel costs are calculated, consider the average travel cost of a Leeds United fan residing in the ring 17.5 to 22.5 reported miles from Elland Road (Leeds United’s stadium). Note that distance is measured from the midpoint of the zone. Therefore the zone’s direct costs is taken as 20 miles multiplied by 21.95 pence (the non-London overall direct cost per mile for a return journey), that is £4.39. Invoking the distinction between “peak” and “off-peak” speeds around three straight line miles from the club (or 5.218 reported miles based on Leeds United’s distance regression in table 4.2) gives the calculated time taken by car users as 109.8 minutes to make the 20 mile return journey. Given that buses travel one third more slowly than cars, bus users will take a calculated time of 175 minutes to make the 20 mile return journey.\textsuperscript{27} Valuing each minute at 6.841 pence and taking a weighted average of the two time costs at 69.8% and 30.2% respectively, gives an estimated value for the zone’s time cost of £8.86.

\textsuperscript{25} The standard behavioural value is updated using the index from table E.14 of *Labour Market Trends* (current hourly earnings for full time adult employees including overtime but excluding the effect of absences) as recommended in the *Department of Transport (1987)*.

\textsuperscript{26} The Department of Transport also publishes the standard appraisal value of non-work time. This is the same as the standard behavioural value except for an indirect tax adjustment of 17.3% (the level of indirect taxes net of subsidies at the time the values were first calculated). The standard behavioural value includes the effect of indirect taxes and is therefore at “market prices”, while the standard appraisal value excludes the indirect tax adjustment. The other components of total visit costs are valued at market prices, so for consistency time costs are also valued at market prices.

\textsuperscript{27} In this example the estimated time for car users is:

\[
(\frac{5.218}{17.6} + \frac{(20-5.218)}{23.9}) \times 60 \times 2 = 109.8 \text{ minutes.}
\]

The estimated travel time for bus users is:

\[
(\frac{5.218}{17.6} + \frac{(20-5.218)}{21.9}) \times 60 \times 2 \times \frac{3}{2} = 175 \text{ minutes.}
\]
Adding the direct costs and time costs together gives an estimated value for the zone's travel cost of £13.25 for a return journey. Moving to the next ring, 22.5 to 27.5 reported miles from Elland Road increases the estimated travel cost to £16.39 due to a £1.10 rise in the direct cost and a £2.04 rise in the time cost.

It is not clear *a priori* whether the other component of the generalised cost, namely the ticket price, varies from zone to zone. In chapter three it was noted that people in the inner zones may be inclined to buy a cheaper ticket than people in the outer zones. Alternatively the reverse could be true. To resolve the matter, a fan's ticket price from question 4b was regressed against his or her reported distance from question 8a, across all clubs and distinguishing between season ticket holders and non-season ticket holders. The equation has zero explanatory power (i.e. the $R^2$ is zero). Based on this result, the ticket price is taken to be the same in every zone.

A club's ticket price is taken as a weighted average of (i) the average of the price of a season ticket (divided by nineteen games) and (ii) the average price of a match ticket from question 4b. Each element is weighted by the proportion of tickets sold to season ticket holders and non-season ticket holders from question 4a (which reveals whether a fan was a season ticket holder) and question 1a on the frequency of home attendance. Table 4.4 shows the resulting ticket price for each club. Chelsea had the highest ticket price and Wimbledon had the lowest ticket price. The median ticket price was £12.27.
Table 4.4: Mean Ticket Prices

<table>
<thead>
<tr>
<th>CLUB</th>
<th>Ticket Price £</th>
<th>CLUB</th>
<th>Ticket Price £</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenal</td>
<td>16.64</td>
<td>Man. United</td>
<td>17.48</td>
</tr>
<tr>
<td>Aston Villa</td>
<td>11.44</td>
<td>Middlesbrough</td>
<td>12.25</td>
</tr>
<tr>
<td>Blackburn Rovers</td>
<td>15.17</td>
<td>Newcastle United</td>
<td>15.94</td>
</tr>
<tr>
<td>Bolton Wanderers</td>
<td>10.23</td>
<td>Nottingham Forest</td>
<td>12.29</td>
</tr>
<tr>
<td>Chelsea</td>
<td>19.68</td>
<td>QPR</td>
<td>10.88</td>
</tr>
<tr>
<td>Coventry City</td>
<td>11.11</td>
<td>Sheffield W.</td>
<td>9.68</td>
</tr>
<tr>
<td>Everton</td>
<td>10.41</td>
<td>Southampton</td>
<td>13.67</td>
</tr>
<tr>
<td>Leeds United</td>
<td>10.89</td>
<td>Tottenham Hotspur</td>
<td>19.65</td>
</tr>
<tr>
<td>Liverpool</td>
<td>13.97</td>
<td>West Ham United</td>
<td>14.35</td>
</tr>
<tr>
<td>Manchester City</td>
<td>11.34</td>
<td>Wimbledon</td>
<td>6.79</td>
</tr>
</tbody>
</table>

The generalised cost for a zone (GENCOSTi) comprises of a zone’s travel cost plus a club’s ticket price. For example, previously we found that a Leeds United fan residing in the ring 17.5 to 22.5 reported miles from Elland Road had an estimated travel cost of £13.25 for a return journey. Adding Leeds United’s mean ticket price (£10.89) to this value gives the estimated generalised cost for the zone of £24.14. This is the cost of attending a game attributed to any resident in the zone 17.5 to 22.5 reported miles from Leeds’ ground.

As discussed in chapter three, a variable is required to account for the fact that one reason ticket sales per capita falls with distance from a stadium is that communities further from the stadium have less affinity for a club, in the sense that they have less feeling that the club represents the place where they live. The degree of commitment to a club in a zone (AFFINITYi) is estimated using data on the frequency of away attendance from question 1a on the Survey. To determine
AFFINITY, we first estimate the total number of committed fans at a club. This is taken as the difference between the club’s average home attendance from the Rothman’s Football Yearbook and the average allocation for away fans from Ladd(1996), multiplied by the proportion of a club’s fans attending three or more away games from question la.

The format of the Survey question was multiple choice (“None”, “1-2”, “3-5”, “6-10”, “11-15” and “16 or more” away games attended) and did not ask for a specific number of away games. The threshold is set at three or more away games when calculating AFFINITY since there is the danger that travel costs to one or two away matches may be correlated with travel costs to a team’s home stadium. A fan may have ticked the “1-2” response, not because he is particularly committed to a club, but because the opponents are comparably near to his place of residence and possibly even nearer than his own club. However it is less likely that a systematic relationship exists between travel costs to the study club and travel costs to away matches once one considers only those going to three or more away games.

The next stage is to distribute the estimate of the total number of committed fans at a club amongst the club’s zones. The distribution is based on the inter-zonal proportions of fans attending three or more away games from question la (assuming a representative sample). Finally the zonal number of committed fans is divided by the corresponding zonal population. This gives the measure of the commitment to a club in a zone, the proportion of the zonal population attending
three or more away games in the 1995/96 season.

There are other questions on the Survey, besides the frequency of away attendance, that may be used as a basis for estimating $\text{AFFINITY}_z$. Instead we could estimate the proportion of the zonal population owning a season ticket (from question 4a) or the proportion of the zonal population that attend live games and were born in the area where their team plays (from question 2a). However the proportion of the zonal population attending three or more away games (from question 1a) is likely to be the best proxy for the commitment to a club in a zone. Owning a season ticket does not necessarily mean that a fan is committed to a club. Many clubs are near to being all season ticket stadiums, so for these clubs casual fans may have no other option but to buy a season ticket if they wish to attend games. Being born in an area also does not necessarily mean that that a respondent is committed. It is possible that a person who has moved to an area may support a local team with greater fervour than someone who was born in the area.

Measures of the mean income of a zone and the zonal population are based on data from the 1991 Census. The population is defined as the number of people usually resident in a zone and aged from 10 to 70, based on table two of the small area and local base statistics of the 1991 Census. The income variable is defined as the proportion of the zonal population where the head of the household belongs to social class one or two (professional, managers and technical occupations) from table ninety of the Census. The Census does not contain a direct question on income (or wages) so consequently a proxy for income is used. To show that a
proxy for income is being used, the income variable shall now be represented as SCL12; rather than INCOME;.

The Census data are stored at the Manchester Computing Centre. First, the data were transferred from the Manchester Computing Centre to a personal computer using the SASPAC computer package. The data were then aggregated into rings using the GIS MapInfo computer package (professional version 4.5). There are four levels of geography in the 1991 Census: county, ward, district and enumeration district. The enumeration district data were used to ensure the greatest accuracy as this is the smallest spatial unit. For example, there are 150,000 enumeration districts in Great Britain, each averaging 150 households. This compares with 11,000 wards, each containing an average of 2000 households. Since a given Census area is identified by an ordnance survey easting and northing, the 1991 Census data could be aggregated into rings only in terms of a radial straight-line distance from a club. The rings are in terms of a reported distance from a club, so for purposes of employing Census data, the rings were first adjusted so they were in terms of a straight-line distance, using the club-specific distance regressions in table 4.2.

Thus we now have data on each of the variables in our model and we are in a position to estimate the model. The data is based on a series of assumptions. In chapter five the results are presented based on the core assumptions and the model is then re-estimated in chapter six under alternative assumptions as a sensitivity test.
References


Department of Transport (1987), *Values for Journey Time Savings and Accident Prevention*, HMSO.


*Labour Market Trends*, HMSO, table E.14 (previously table 5.6).


Chapter 5: Results for the modified zonal travel cost model

It is assumed that the percentage change in the dependent variable is a linear function of a unit change in the explanatory variables, that is we employ a semi-log functional form, in common with most travel cost applications:

\[
\ln \text{TICKETS}_i = \alpha_0 + \alpha_1 \text{GENCOST}_i + \alpha_2 \text{AFFINITY}_i + \alpha_3 \text{SCL12}_i
\]

where the variables are as defined in chapter four. Other travel costs applications that have used the semi-log model include Willis and Garrod (1991) and Anex (1995). Semi-log is the preferred functional form since it has the advantage of excluding negative visits (in contrast with the linear model) and it implies finite visits at zero travel costs (in contrast with the double log model).\(^{28}\)

The semi-log model also has an advantage in relation to the model’s error term. Unfortunately the zonal travel cost model is prone to heteroskedasticity. The outer zones tend to have a lower error variance than the inner zones, due to the greater population in the outer zones and their lower mean visits per capita. This means that t tests are invalid unless we perform weighted least squares. There are several variations on weighted least squares discussed in the travel cost literature. Christensen and Price (1982) correct for heteroskedasticity by assuming that the variance of the visit rate equals the expected mean visits per capita divided by the

\(^{28}\) The semi-log, double log and linear functions allow the ticket price elasticity to vary along the demand curve. However there are functions, such as the rectangular hyperbola, which give the same ticket price elasticity at every point on the demand curve.
zonal population. Bowes and Loomis (1980) correct for heteroskedasticity by assuming that the variance of the visit rate equals a constant variance divided by the zonal population. Each of these studies applies weighted least squares to a linear model. However Strong (1983) and also Vaughan, Russell and Hazilla (1982) both show that, whilst weighted least squares is needed with a linear model, it is not required with a semi-log model. They propose that the natural log transformation of the dependent variable naturally moves the error variances towards homogeneity.

The results for the semi-log model are given in table 5.1. In the table the model’s coefficients are given in the left hand side of each column. For example Arsenal’s GENCOST coefficient ($\alpha_1$) is $-0.036$. The standard errors are given in parentheses on the right hand side of each column. The number of stars indicates the significance of a variable at a particular club. For example, Arsenal’s GENCOST coefficient has two stars indicating that the variable is significant at the 5% level. Three stars indicate significance at the 1% level, two stars at the 5% level and one star indicates significance at the 10% level. No stars mean that the corresponding coefficient is not significantly different from zero even at the 10% level of significance.

The t-tests are valid since none of the club regressions exhibits heteroskedasticity. Taking the square of the model’s residuals (which serve as a proxy for the error variance) and regressing it on a constant and the square of the fitted values shows that the square of the fitted values is insignificant for every
### TABLE 5.1: OLS POOLED REGRESSION RESULTS

<table>
<thead>
<tr>
<th>CLUB</th>
<th>FIXED EFFECT</th>
<th>GENCOST</th>
<th>AFFINITY</th>
<th>SCL12</th>
<th>R²</th>
<th>Rings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenal</td>
<td>1.05 (2.04)</td>
<td>-0.036</td>
<td>2.48</td>
<td>0.037</td>
<td>0.97</td>
<td>12</td>
</tr>
<tr>
<td>Aston Villa</td>
<td>3.29 (2.29)</td>
<td>-0.092</td>
<td>1.28</td>
<td>0.024</td>
<td>0.98</td>
<td>12</td>
</tr>
<tr>
<td>Blackburn Rovers</td>
<td>-2.30 (1.84)</td>
<td>-0.151</td>
<td>0.63</td>
<td>0.242</td>
<td>0.98</td>
<td>10</td>
</tr>
<tr>
<td>Bolton Wanderers</td>
<td>2.59 (1.62)</td>
<td>-0.095</td>
<td>1.34</td>
<td>-0.003</td>
<td>0.94</td>
<td>10</td>
</tr>
<tr>
<td>Chelsea</td>
<td>1.02 (2.32)</td>
<td>-0.038</td>
<td>2.02</td>
<td>0.034</td>
<td>0.99</td>
<td>12</td>
</tr>
<tr>
<td>Coventry City</td>
<td>-1.14 (1.03)</td>
<td>-0.094</td>
<td>2.17</td>
<td>0.108</td>
<td>0.95</td>
<td>12</td>
</tr>
<tr>
<td>Everton</td>
<td>1.13 (2.05)</td>
<td>-0.050</td>
<td>1.66</td>
<td>0.043</td>
<td>0.93</td>
<td>12</td>
</tr>
<tr>
<td>Leeds United</td>
<td>1.54 (1.87)</td>
<td>-0.065</td>
<td>2.12</td>
<td>0.054</td>
<td>0.96</td>
<td>12</td>
</tr>
<tr>
<td>Liverpool</td>
<td>-0.26 (1.43)</td>
<td>-0.027</td>
<td>2.69</td>
<td>0.075</td>
<td>0.96</td>
<td>16</td>
</tr>
<tr>
<td>Manchester City</td>
<td>-1.10 (1.88)</td>
<td>-0.065</td>
<td>2.52</td>
<td>0.113</td>
<td>0.97</td>
<td>12</td>
</tr>
<tr>
<td>Manchester United</td>
<td>5.18 (0.71)</td>
<td>-0.300</td>
<td>0.11</td>
<td>0.142</td>
<td>0.92</td>
<td>10</td>
</tr>
<tr>
<td>Middlesbrough</td>
<td>4.12 (1.00)</td>
<td>-0.123</td>
<td>0.37</td>
<td>0.071</td>
<td>0.92</td>
<td>10</td>
</tr>
<tr>
<td>Newcastle</td>
<td>2.02 (1.72)</td>
<td>-0.102</td>
<td>1.22</td>
<td>0.080</td>
<td>0.98</td>
<td>12</td>
</tr>
<tr>
<td>Nottingham Forest</td>
<td>0.93 (1.89)</td>
<td>-0.049</td>
<td>5.68</td>
<td>0.011</td>
<td>0.96</td>
<td>12</td>
</tr>
<tr>
<td>QPR</td>
<td>6.11 (1.65)</td>
<td>-0.064</td>
<td>2.37</td>
<td>-0.121</td>
<td>0.93</td>
<td>12</td>
</tr>
<tr>
<td>Southampton</td>
<td>3.82 (1.03)</td>
<td>-0.127</td>
<td>0.49</td>
<td>0.047</td>
<td>0.98</td>
<td>12</td>
</tr>
<tr>
<td>Tottenham Hotspur</td>
<td>0.42 (2.04)</td>
<td>-0.031</td>
<td>4.11</td>
<td>0.038</td>
<td>0.97</td>
<td>12</td>
</tr>
<tr>
<td>West Ham United</td>
<td>-0.52 (2.83)</td>
<td>-0.021</td>
<td>7.62</td>
<td>0.035</td>
<td>0.98</td>
<td>12</td>
</tr>
<tr>
<td>Wimbledon</td>
<td>0.09 (1.96)</td>
<td>-0.042</td>
<td>8.99</td>
<td>0.009</td>
<td>0.97</td>
<td>12</td>
</tr>
</tbody>
</table>

Dependent variable: (natural log) ticket sales per 100 people aged 10 to 70 (TICKETS_10-70)
Independent variables: GENCOST, AFFINITY, SCL12
Standard errors in parentheses
*** denotes significance at the 1% level, ** at the 5% level and * at the 10% level
club. In other words, there is no evidence of heteroskedasticity. Other tests also show that none of the club regressions have non-normal errors (based on the Bera-Jarque test (1980)), which also has the potential to make the t-tests invalid, and only three club regressions show signs of first order serial correlation (Blackburn Rovers, Manchester City and Wimbledon), based on the Lagrange Multiplier LM(1) test. However, in each case the serial correlation is only at the 10% level.29 Other statistics also confirm the high power of the model. On average, the model explains 96% of the inter-zonal variation in ticket sales at each club (the model’s R²) and the model typically over-predicts ticket sales by 3.6% at each club.

The values in table 5.1 were obtained by estimating a pooled regression across all the clubs with club specific fixed effects and slope coefficients in an effort to increase the model’s degrees of freedom. Estimating a separate regression for each club would give only eight degrees of freedom (with twelve zones and three variables plus a constant). However estimating a pooled regression increases the degrees of freedom by almost a factor of twenty. Pooling the data involves estimating a single semi-log model across all of the clubs. The model is estimated across 236 observations (grouping all the clubs’ zones together) but, unlike previous pooled studies on the demand for live soccer such as Baimbridge et al (1996), the values of the coefficients are allowed to vary across clubs. Each club had its own fixed effect and club specific slope coefficients. With 80 parameters, this gives 156 degrees of freedom.

29 In a spatial context first order serial correlation would mean that the error in one ring is correlated with the error in an adjacent ring.
Likelihood-ratio tests show that it is appropriate to have club-specific coefficients and fixed effects in the pooled regression. The hypothesis that every club has the same GENCOST coefficient is rejected at the 1% level (the LR statistic is 288.1 with nineteen degrees of freedom). Similarly the hypothesis that every club has the same fixed effect is rejected at the 1% level. The hypotheses that every club has the same AFFINITY coefficient and that every club has the same SCL12 coefficient are also rejected, each at the 1% level.

From the results in table 5.1 we can draw a number of conclusions with regard to the demand curve for live soccer. First we can conclude that the demand curve for live soccer is downward sloping with respect to changes in the composite cost of attendance, since the GENCOST coefficient is negative for every club. In eighteen cases the variable is significant at the 1% level and in every case it is significant at the 5% level. The general significance of the AFFINITY variable confirms the need for a control for affinity effects. There is also indirect evidence that soccer is a normal good. The SCL12 coefficient is positive at eighteen clubs and it is significant for eight clubs at the 10% level. However, while this is very suggestive that soccer is a normal good, it is not conclusive, since our measure of income (social class) is only a proxy for income. Different classes may have different tastes for soccer, independent of income, and this could also explain variations in attendance between classes.

These results are all the more remarkable given the high degree of collinearity between the GENCOST and AFFINITY variables. As we move further
from a stadium, GENCOST increases on account of the higher travel costs while AFFINITY falls due to fans' strong sense of place. As a result the two variables have a large negative coefficient of correlation ranging from –0.56 at Liverpool to –0.89 at Chelsea (median value –0.67). The collinearity has the effect of increasing the standard error of the GENCOST and AFFINITY coefficients. This makes the t-tests underestimate the significance of the two variables. Thus the travel cost and affinity effects are likely to be even more significant than indicated. The collinearity is unavoidable. To exclude the AFFINITY variable would attribute the affinity effect to the GENCOST variable. Since the two variable are negatively correlated this would serve to bias the ticket price elasticity upwards.

Our main concern is with the ticket price elasticity. Recall that previous studies on the demand for live soccer yielded highly inelastic estimates of the ticket price elasticity. For example, Dobson and Goddard (1995) estimate a ticket price elasticity of –0.078 at Division One prices and Bird (1982) estimates a ticket price elasticity of –0.22 for the entire English Football League. Szymanski and Smith (1997) estimate a ticket price elasticity of –0.34 for the English Football League. In chapter two we argued that these estimates are inconsistent with both profit and revenue maximisation. If a club sets its ticket price to maximise profits or gate receipts then it should have a ticket price elasticity of minus one or an elastic demand, unless there are significant complementary sales, which may explain an inelastic demand. Merchandising had very little exposure in the time periods considered by the previous studies, so complementary sales cannot account for the highly inelastic estimates from the previous studies.
Using the values in table 5.1, it is possible to estimate a ticket price elasticity for each of the 1995/96 Premier League clubs. An estimate of a club's ticket price elasticity is given by its GENCOST coefficient multiplied by its mean ticket price. This assumes that travel cost effects duplicate admission price effects (a full proof of this result is given in appendix two). For example, Arsenal has a GENCOST coefficient of \(-0.0357\) (to 4 decimal places) and a mean ticket price of £16.644 (from table 4.4). Multiplying the two together gives an estimate of Arsenal's ticket price elasticity of \(-0.594\). A full list of the ticket price elasticity estimates is given in table 5.2 below.

When the ticket price elasticity estimates are examined in more detail, we can see that there is a high degree of heterogeneity across clubs. Fans of the London clubs tend be less responsive to changes in the ticket price than fans of the northern clubs. Five of the seven clubs with the most inelastic demands in table 5.2 are from London. This finding is in contrast to Dobson and Goddard (1995). Dividing the country into "north" and "south", with a line through Swansea and Coventry, Dobson and Goddard found that price sensitivity is greater in the south than the north based on a sample of ninety-four clubs. Dobson and Goddard (1995) estimate two attendance models, a pooled model fixing coefficients across clubs, which gives a ticket price elasticity of \(-0.078\) at Division One prices, and a club-specific time series model, which gives a median ticket price elasticity of \(-0.181\) across twenty four clubs with a significant price effect. None of the estimates of the ticket price elasticity in the table 5.2 are as low as the figures of \(-0.078\) or \(-0.181\) reported by Dobson and Goddard.
Table 5.2 Estimates of the Ticket Price Elasticity

<table>
<thead>
<tr>
<th>Club</th>
<th>Mean ticket price</th>
<th>Ticket Price Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middlesbrough</td>
<td>12.25</td>
<td>-3.67</td>
</tr>
<tr>
<td>Blackburn Rovers</td>
<td>15.17</td>
<td>-2.29</td>
</tr>
<tr>
<td>Newcastle United</td>
<td>15.94</td>
<td>-1.96</td>
</tr>
<tr>
<td>Southampton</td>
<td>13.67</td>
<td>-1.73</td>
</tr>
<tr>
<td>Manchester United</td>
<td>17.48</td>
<td>-1.27</td>
</tr>
<tr>
<td>Nottingham Forest</td>
<td>12.29</td>
<td>-1.26</td>
</tr>
<tr>
<td>Aston Villa</td>
<td>11.44</td>
<td>-1.05</td>
</tr>
<tr>
<td>Coventry City</td>
<td>11.11</td>
<td>-1.04</td>
</tr>
<tr>
<td>Bolton Wanderers</td>
<td>10.23</td>
<td>-0.97</td>
</tr>
<tr>
<td>Chelsea</td>
<td>19.68</td>
<td>-0.74</td>
</tr>
<tr>
<td>Manchester City</td>
<td>11.34</td>
<td>-0.73</td>
</tr>
<tr>
<td>Leeds United</td>
<td>10.89</td>
<td>-0.70</td>
</tr>
<tr>
<td>Sheffield Wed.</td>
<td>9.68</td>
<td>-0.62</td>
</tr>
<tr>
<td>Tottenham Hotspur</td>
<td>19.65</td>
<td>-0.62</td>
</tr>
<tr>
<td>Arsenal</td>
<td>16.64</td>
<td>-0.59</td>
</tr>
<tr>
<td>QPR</td>
<td>10.88</td>
<td>-0.53</td>
</tr>
<tr>
<td>Everton</td>
<td>10.41</td>
<td>-0.52</td>
</tr>
<tr>
<td>Liverpool</td>
<td>13.97</td>
<td>-0.38</td>
</tr>
<tr>
<td>West Ham United</td>
<td>14.35</td>
<td>-0.30</td>
</tr>
<tr>
<td>Wimbledon</td>
<td>6.79</td>
<td>-0.28</td>
</tr>
<tr>
<td>Median (all clubs)</td>
<td>12.27</td>
<td>-0.74</td>
</tr>
</tbody>
</table>

Only in the case of the London and Liverpool clubs are the estimates of the ticket price elasticity as low as those in Szymanski and Smith (1997) and Bird (1982). The median ticket price elasticity in table 5.2 is -0.74 (obtained by ranking the clubs in order of their ticket price elasticity and taking a value between the 10th and 11th club). Such a ticket price elasticity may be consistent with profit
maximisation, in spite of being inelastic, due to the high levels of merchandising revenue at the time in the Premier League. For example the Deloitte and Touche annual report into the finances of soccer clubs shows that during the 1997/98 season, merchandising accounted for 34% of combined Premier League turnover.

Six of the clubs listed in table 5.2 have a ticket price elasticity more elastic than −1.2. At first glance a very elastic demand may seem to conflict with the goals of profit or revenue maximisation. Most of a club’s costs are fixed costs (e.g. wages). Therefore the marginal cost of admitting one more spectator is very small, which implies that a club maximises profit at a point where demand is unit elastic or just slightly elastic. On this basis, a highly elastic demand could only be explained by a very high marginal cost.

However, it is possible to reconcile profit maximisation with a very elastic demand if a club faces a binding capacity constraint. i.e. the stadium cannot accommodate the number of people that the optimum ticket price would attract. The capacity constraint forces a profit maximising club to charge a ticket price on the elastic portion of demand in spite of a small marginal cost. The figures on average match attendance and stadium capacity in the Rothmans Football Yearbook show that four of the six clubs with a ticket price elasticity more elastic than −1.2 were regularly sold out during the 1995/96 season, which can explain their ticket price elasticity estimates.

For example, in the 1995/96 season, Newcastle’s stadium had a maximum
capacity of 36,610 and an average match attendance of 36,507, giving a ratio of 99.7%. On the basis of such numbers Newcastle United is a capacity constrained club, which can account for its price elasticity of -1.96. The other capacity constrained clubs in the 1995/96 season were Middlesbrough, Southampton, Manchester United and Arsenal. Each club had a ratio of average match attendance to capacity greater than 0.95. Match attendance at the remaining clubs is typically 81% of capacity but this is not sufficiently close to 100% to view the clubs as capacity constrained.

Comparing the ticket price elasticity estimates in table 5.2 with estimates from previous studies, we can conclude that the estimates derived from the zonal travel cost model are more consistent with profit maximisation than the previous estimates of the ticket price elasticity. Improving on previous studies by incorporating travel costs into the analysis yields more credible estimates of the ticket price elasticity.

Table 5.3 shows the confidence intervals on the ticket price elasticity estimates based on the GENCOST standard errors. Strictly speaking we should not calculate confidence intervals on the ticket price elasticity estimates. The confidence interval assumes that we know the true ticket price (i.e. the standard error of the ticket price is zero) but the ticket price is derived from a sample, and thus will have an error associated with it. However, the error will be small given the size of the National Fan Survey and the measured confidence intervals here are likely therefore to be legitimate indicators. Estimates of the ticket price elasticity
are presented using regression coefficients at the lower, middle and top end of the 95% confidence interval for those coefficients. The final column shows the variation in the point elasticity going to either extreme of the confidence interval.

Table 5.3: Confidence Intervals on the Ticket Price Elasticity

<table>
<thead>
<tr>
<th>Club</th>
<th>lower 95% C.I.</th>
<th>Point Ticket Price Elasticity</th>
<th>upper 95% C.I.</th>
<th>variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middlesbrough</td>
<td>-4.54</td>
<td>-3.67</td>
<td>-2.81</td>
<td>23.5%</td>
</tr>
<tr>
<td>Blackburn Rovers</td>
<td>-2.81</td>
<td>-2.29</td>
<td>-1.78</td>
<td>22.3%</td>
</tr>
<tr>
<td>Newcastle United</td>
<td>-3.26</td>
<td>-1.96</td>
<td>-0.65</td>
<td>66.6%</td>
</tr>
<tr>
<td>Southampton</td>
<td>-2.01</td>
<td>-1.73</td>
<td>-1.46</td>
<td>15.7%</td>
</tr>
<tr>
<td>Manchester United</td>
<td>-1.62</td>
<td>-1.27</td>
<td>-0.93</td>
<td>27.1%</td>
</tr>
<tr>
<td>Nottingham Forest</td>
<td>-1.51</td>
<td>-1.26</td>
<td>-1.00</td>
<td>20.2%</td>
</tr>
<tr>
<td>Aston Villa</td>
<td>-1.30</td>
<td>-1.05</td>
<td>-0.80</td>
<td>24.1%</td>
</tr>
<tr>
<td>Coventry City</td>
<td>-1.26</td>
<td>-1.04</td>
<td>-0.82</td>
<td>21.3%</td>
</tr>
<tr>
<td>Bolton Wanderers</td>
<td>-1.29</td>
<td>-0.97</td>
<td>-0.66</td>
<td>32.6%</td>
</tr>
<tr>
<td>Chelsea</td>
<td>-1.41</td>
<td>-0.74</td>
<td>-0.07</td>
<td>90.1%</td>
</tr>
<tr>
<td>Manchester City</td>
<td>-0.96</td>
<td>-0.73</td>
<td>-0.50</td>
<td>31.6%</td>
</tr>
<tr>
<td>Leeds United</td>
<td>-0.93</td>
<td>-0.70</td>
<td>-0.48</td>
<td>32.3%</td>
</tr>
<tr>
<td>Sheffield Wed.</td>
<td>-0.82</td>
<td>-0.62</td>
<td>-0.41</td>
<td>33.0%</td>
</tr>
<tr>
<td>Tottenham Hotspur</td>
<td>-1.02</td>
<td>-0.62</td>
<td>-0.21</td>
<td>65.8%</td>
</tr>
<tr>
<td>Arsenal</td>
<td>-1.11</td>
<td>-0.59</td>
<td>-0.08</td>
<td>87.0%</td>
</tr>
<tr>
<td>QPR</td>
<td>-0.75</td>
<td>-0.53</td>
<td>-0.32</td>
<td>39.9%</td>
</tr>
<tr>
<td>Everton</td>
<td>-0.75</td>
<td>-0.52</td>
<td>-0.29</td>
<td>44.2%</td>
</tr>
<tr>
<td>Liverpool</td>
<td>-0.48</td>
<td>-0.38</td>
<td>-0.27</td>
<td>27.3%</td>
</tr>
<tr>
<td>West Ham United</td>
<td>-0.59</td>
<td>-0.30</td>
<td>-0.02</td>
<td>94.0%</td>
</tr>
<tr>
<td>Wimbledon</td>
<td>-0.42</td>
<td>-0.28</td>
<td>-0.15</td>
<td>46.4%</td>
</tr>
<tr>
<td>Median (all clubs)</td>
<td>-1.19</td>
<td>-0.74</td>
<td>-0.49</td>
<td>32.5%</td>
</tr>
</tbody>
</table>

The confidence intervals are relatively narrow. The median variation is
only 32.5%. None of the confidence intervals are so large as to generate a positive
ticket price elasticity at the 95% upper bound. There are only twelve instances
where demand is elastic at the lower bound and four instances at the upper bound.
This compares with eight cases where the point estimate is elastic (as highlighted
in bold). The fact that the confidence intervals are narrow is reassuring, especially
in light of the collinearity between GENCOST and AFFINITY which serves to
exaggerate the size of the confidence intervals.

Table 5.4 shows a point estimate of each club’s consumer price elasticity
next to its ticket price elasticity. The consumer price elasticity is given by a club’s
GENCOST coefficient multiplied by the mean of its ticket price and travel costs
across all of its zones, weighting each zone by its proportion of total predicted
ticket sales. The consumer price elasticity shows the effect of a 1% change in the
full consumer price (the ticket price and travel costs) on total ticket sales. In
contrast, the ticket price elasticity shows the effect of a 1% change in the ticket
price on total ticket sales. Only the ticket price elasticity is relevant to a club’s
optimal pricing strategy, but it is nevertheless interesting to examine the consumer
price elasticity. As expected the ticket price elasticity is smaller than the consumer
price elasticity for every club. This is because a proportionate change in the total
must have a larger impact than a similar relative change in only one component of
cost.
Table 5.4: Estimates of the Consumer Price Elasticity

<table>
<thead>
<tr>
<th></th>
<th>Ticket Price Elasticity</th>
<th>Consumer Price Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middlesbrough</td>
<td>-3.67</td>
<td>-5.00</td>
</tr>
<tr>
<td>Blackburn Rovers</td>
<td>-2.29</td>
<td>-3.12</td>
</tr>
<tr>
<td>Newcastle United</td>
<td>-1.96</td>
<td>-2.63</td>
</tr>
<tr>
<td>Southampton</td>
<td>-1.73</td>
<td>-3.04</td>
</tr>
<tr>
<td>Manchester United</td>
<td>-1.27</td>
<td>-1.99</td>
</tr>
<tr>
<td>Nottingham Forest</td>
<td>-1.26</td>
<td>-2.27</td>
</tr>
<tr>
<td>Aston Villa</td>
<td>-1.05</td>
<td>-1.85</td>
</tr>
<tr>
<td>Coventry City</td>
<td>-1.04</td>
<td>-1.58</td>
</tr>
<tr>
<td>Bolton Wanderers</td>
<td>-0.97</td>
<td>-1.45</td>
</tr>
<tr>
<td>Chelsea</td>
<td>-0.74</td>
<td>-1.24</td>
</tr>
<tr>
<td>Manchester City</td>
<td>-0.73</td>
<td>-1.31</td>
</tr>
<tr>
<td>Leeds United</td>
<td>-0.70</td>
<td>-1.41</td>
</tr>
<tr>
<td>Sheffield Wed.</td>
<td>-0.62</td>
<td>-1.17</td>
</tr>
<tr>
<td>Tottenham Hotspur</td>
<td>-0.62</td>
<td>-1.04</td>
</tr>
<tr>
<td>Arsenal</td>
<td>-0.59</td>
<td>-1.08</td>
</tr>
<tr>
<td>QPR</td>
<td>-0.53</td>
<td>-1.01</td>
</tr>
<tr>
<td>Everton</td>
<td>-0.52</td>
<td>-0.91</td>
</tr>
<tr>
<td>Liverpool</td>
<td>-0.38</td>
<td>-0.82</td>
</tr>
<tr>
<td>West Ham United</td>
<td>-0.30</td>
<td>-0.60</td>
</tr>
<tr>
<td>Wimbledon</td>
<td>-0.28</td>
<td>-0.61</td>
</tr>
<tr>
<td>Median (all clubs)</td>
<td>-0.74</td>
<td>-1.36</td>
</tr>
</tbody>
</table>

The distinction between the ticket price elasticity and the consumer price elasticity can be illustrated by means of an example. Arsenal has a mean ticket price of £16.64. If this were to increase by 1% then according to the club's ticket price elasticity point estimate (-0.59) total ticket sales would fall by 0.59%. Gate receipts would rise since the proportionate decrease in ticket sales is less than the
proportionate increase in the ticket price. The ticket price is the same in every zone but the generalised cost, consisting of the ticket price and travel costs, is greater in the outer zones than the inner zones. If the generalised cost were to increase by 1% in every zone then according to the club’s consumer price elasticity point estimate (-1.08) total ticket sales would fall by 1.08%. Unlike in the first scenario we cannot predict the impact on a club’s gate receipts, as it is not known how the 1% increase in the generalised costs is divided between the ticket price and travel costs of a fan. The impact of a 1% increase in the generalised cost (£16.64 plus travel costs) is greater than a 1% increase in the ticket price (£16.44) since the former has the largest monetary value.

It is also interesting to consider zone-by-zone estimates of the ticket price elasticity. Figure 5.1 shows the ticket price elasticity at two representative clubs, QPR and Leeds United, beginning at the innermost zone (zone 1) and moving to the outermost zone (zone 12). In the case of QPR we see that demand is elastic in the first two zones, after which demand becomes increasingly inelastic with distance from the stadium. The same pattern is observed at Leeds United. In the case of Leeds, the innermost zone has a ticket price elasticity of -3.4. By the outermost zone the ticket price elasticity is -0.1. Generally the absolute value of the ticket price elasticity falls with distance from the stadium at all clubs.
Such zone-by-zone ticket estimates of the ticket price elasticity accord with our understanding of consumer behaviour. Among local spectators an $x\%$ increase in the ticket price corresponds to an $x\%$ increase in the generalised cost. However among fans living much further from the stadium an $x\%$ increase in the ticket price corresponds to significantly less than an $x\%$ increase in the generalised cost. A given change in the ticket price means more for local spectators in terms of the generalised cost than distant spectators. Based on Marshall's principle that it is
"important to be unimportant", we would expect people in the inner zones to be more sensitive to changes in price.

The fact that demand is elastic in the inner zones and inelastic in the outer zones has policy implications. Clubs quote the same ticket price to fans regardless of where they live. However, clubs could increase their profits by charging fans in the immediate vicinity of the stadium a lower price than fans in outlying areas. Reducing price where demand is elastic and increasing price where demand is inelastic raises profits.

However, where as spatial price discrimination could raise profits it may not be optimal in terms of social efficiency. High travel costs may deter fans in lower income groups from attending matches. Increasing ticket prices in outlying areas could exacerbate any social exclusion. There are also practical difficulties in implementing spatial price discrimination. It requires that clubs can keep the two markets separate, but it would be difficult to prevent a person living in a high price area applying for a ticket using the address of a friend living in a low price area.
References


Deloitte and Touche (1999), *Deloitte and Touche Annual Review of Football*
Finance (1997-98 season), Manchester.


Chapter 6: Sensitivity tests

The findings in the previous chapter are based on a number of assumptions. In this chapter we shall test the sensitivity of the findings to changes in the core assumptions. The focus of the discussion is table 6.1 given overleaf. The core estimates of the ticket price elasticity from chapter five are repeated in column one of the table. In the other columns the ticket price elasticities have been recalculated based on alternative assumptions. Each column involves changing just one assumption. Six alternative estimates are presented.

It has already been noted that opinion is divided on whether motorists perceive the full running costs of a car or the more immediately obvious petrol costs. The core estimates of the ticket price elasticity in column one assume that motorists perceive full running costs. However, in column two the ticket price elasticities are recalculated substituting petrol only costs (8.9 pence per mile) for full running costs (14.19 pence per mile) in respect of the attribution of car travel costs.

The core estimates of the ticket price elasticity assume that 69.8% of fans travel by car based on the National Fan Survey. However, in the travel cost literature it is more common to assign a weight of 100% to the car, partly to eliminate the practical difficulties of collecting data on the cost of public transport and because about 90% of visitors to environmental sites typically travel by car,
<table>
<thead>
<tr>
<th>Club</th>
<th>(1) Elasticity (central estimates)</th>
<th>(2) Elasticity (petrol-only costs)</th>
<th>(3) Elasticity (least cost assumption)</th>
<th>(4) Elasticity (straight-line distances)</th>
<th>(5) Elasticity (low value of time)</th>
<th>(6) Elasticity (population aged 10 plus)</th>
<th>(7) Elasticity (only season ticket)</th>
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<td>-2.08</td>
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<td>-1.53</td>
<td>-1.51</td>
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<tr>
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<tr>
<td>Wimbledon</td>
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<td>-0.30</td>
<td>-0.31</td>
<td>-0.37</td>
<td>-0.34</td>
<td>-0.29</td>
<td>-0.27</td>
</tr>
<tr>
<td>Median (all clubs)</td>
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<td>-0.79</td>
<td>-0.96</td>
<td>-0.96</td>
<td>-0.89</td>
<td>-0.74</td>
<td>-0.81</td>
</tr>
</tbody>
</table>
according to Clawson and Knetsch (1966).\textsuperscript{30} Given this high proportion it has been argued that other means of transport can be ignored. For example Willis and Garrod (1991) assign a weight of 100\% to the car after noting that 95\% of visitors to the sites (twenty one UK forests) travel by car.

Consequently in column three the ticket price elasticities are re-estimated applying a weight of 100\% to the car, although the car running cost assumption is retained, as only one assumption is changed at a time. Assigning a weight of 100\% to the car can be thought of as the "least cost assumption", since travelling by car is generally cheaper than travelling by public transport. The car is cheaper than the bus in terms of the direct cost and time cost. The car is cheaper than the tube in terms of the direct cost, but not for all journeys in terms of the time cost.\textsuperscript{31} However, if the time cost and the direct cost are added together then the car is cheaper than the tube.

In column four the ticket price elasticities are recalculating basing the travel cost on the straight-line distance from a stadium rather than the reported distance (however in all other respects the assumptions are the same as for column one). For example, consider the ring 17.5 to 22.5 reported miles from a stadium. Thus far the zone's direct cost has been taken as 20 reported miles multiplied by a direct cost per mile for a return journey. The zone's time cost is also based on a

\textsuperscript{30} Clawson and Knetsch (1966) state that "For the intermediate and resource-based areas, studies show that an overwhelming proportion – usually 90\% or more – of all visitors arrive by auto", page 96.

\textsuperscript{31} From chapter four, car running costs equal 14.19 pence per mile. This is less than the standard bus and tube fare (23.2 pence per mile and 19.5 pence per mile respectively) even before the car costs are divided between those in the party.
distance of 20 reported miles. However for column four, 20 reported miles becomes 15.4 straight line miles based on Leeds United’s distance regression, and 14.7 straight line miles based on Manchester United’s distance regression in table 4.2, just to take two clubs. The debate about whether the reported distances are preferable to the straight-line distances as a means of ascertaining travel costs was presented in chapter four. On the one hand, straight-line distances are more objective than the reported distances and hence perhaps more reliable, but on the other hand, it is impossible to travel in a straight line to a soccer match. The Centre for Football Research did not code the postcodes from the 1995/96 Survey, so as a result we used the reported distances after checking their reliability by estimating distance regressions. Column four shows the estimates of the ticket price elasticity that we would have obtained had we based travel costs on linear distance.

The initial calculations assume that the time taken to travel to a soccer match is valued at the standard behavioural value of non-work time. However, it may be argued that the standard behavioural value of non-work time is too high for our purposes. The standard behavioural value reflects commuter and leisure studies, but the journey to a soccer match is a leisure experience undertaken during leisure time (in spite of the travel congestion). Therefore the standard behavioural value may be disproportionately influenced by commuter studies.

A review of evidence on the value of travel time by Wardman (1998) determined that the value of travel time for commuting purposes is on average 26% higher than the value of travel time for leisure purposes based on an
examination of 444 UK value of time estimates. Consequently, in column five the ticket price elasticities are recalculated reducing the standard behavioural value (at 1996 earnings) by 26%. This is an extreme assumption since the standard behavioural value is not based exclusively on commuter studies.

For column six, the population is redefined as the number of people usually resident in a zone and aged 10 or above (previously we excluded both the under 10s and over 70s from the population), but in all other respects the core assumptions are unchanged. In column seven the ticket price elasticities are recalculated using only the responses of season ticket holders in the 1995/96 National Fan Survey. Thus far the ticket price elasticities have been for “all fans”, based on season ticket and non-season ticket responses to the survey, so as to increase the comparability with estimates from previous studies.

Isolating season ticket holders alters the dependent variable, the ticket price and travel cost variables. The dependent variable has thus far been defined as the number of tickets sold to all fans (season ticket holders and non-season ticket holders) during the 1995/96 season per 100 people in a zone. However in column seven total ticket sales, which we distribute among a club’s zones, is taken as the total number of season ticket holders at a club, as specified by Williams (1996), multiplied by the modal number of home games attended by the club’s season ticket holders from question 1a. The ticket price now becomes the average price of a season ticket divided by nineteen games. Considering only season ticket holders also gives new weights for the proportion of fans travelling by car and the
proportion eligible for a discount on public transport: 70.7% of season ticket holders travel by car across all clubs and 27.3% of season ticket holders travelling by public transport are children, full time (adult) students or retired. This compares with 69.8% and 28.1% respectively across the combined sample of season ticket holders and non-season ticket holders.

Examining the various estimates of the ticket price elasticity, we can generally say that the estimates are not over-sensitive to changes in the model’s assumptions. For example, moving to petrol only costs increases the median ticket price elasticity by only 0.05 in absolute terms. As a result the rank of the clubs does not change and only one club (Bolton Wanderers) goes from having an inelastic demand to an elastic demand, as highlighted in bold.

The largest change in the median ticket price elasticity occurs when comparing column one with three. Moving to the least cost assumption increases the median ticket price elasticity by 0.22 in absolute terms and two clubs change from having an inelastic demand to an elastic demand. However this is not a large change, especially considering that the least cost assumption is an extreme assumption.

There are two interpretations of the least cost assumption. It can either mean that all fans actually travel by car or that users of public transport perceive their travel costs as comparable with the (objectively) smaller costs of car travel\textsuperscript{32};

\textsuperscript{32} It could be argued that, if they thought otherwise, they would try to substitute car for public transport travel, e.g. by seeking a lift.
that is, our estimates of direct costs and time costs for public transport are too high. The first interpretation is doubtful since it contradicts the National Fan Survey which shows that 69.8% of all fans travel by car (although 69.8% is a large portion of the respondents, 30.2% is not insignificant and the consequences of ignoring public transport would be much more pronounced than for environmental studies). The second interpretation of the least cost assumption is also doubtful. Car running costs are unlikely to be applicable to bus or tube users since soccer fans would surely remember paying their bus or tube fare. It is not necessary to apply car time costs to the bus or tube since the standard behavioural value of time (which is used in our estimates of car, bus and tube time costs) is applicable to all modes of transport; for example the standard behavioural value already reflects the fact that bus users tend to have a lower value of time than car users. Given that the least cost assumption is not appropriate, we should not be concerned about the associated change in the ticket price elasticity estimates.

In any case, the core assumptions were chosen conservatively to give the lowest estimates of the ticket price elasticity. All of the changes in table 6.1 would serve to increase the median ticket price elasticity in absolute terms and move it nearer to minus one. A ticket price elasticity of minus one corresponds (approximately) with profit maximisation, so altering the assumptions as in the sensitivity test would serve to strengthen our finding that the estimates of the ticket price elasticity from the zonal travel cost model are more consistent with profit maximisation than the estimates from previous studies on the demand for live soccer.
The small difference in the "season ticket" price elasticities in column seven and the "all fan" ticket price elasticities in column one has a bearing on the National Fan Survey. It can be argued that there is a general over-representation of season ticket holders in the Survey. When distributing the questionnaires, the Centre for Football Research aimed for a 2:1 split between season ticket holders and non-season ticket holders to reflect the actual composition of the average home gate; but the actual responses display a 5.5:1 split between season ticket holders and non-season ticket holders.

This has the potential to bias the "all fan" ticket price elasticity estimates if season ticket holders and non-season ticket holders differ substantially in terms of their responsiveness to changes in the admission price. Most of the previous studies on the demand for live soccer group season ticket holders and non-season ticket holders together, so it is difficult to determine their respective ticket price elasticities from previous studies. Simmons (1996) find that "all fans" are less responsive to changes in the ticket price than non-season ticket holders, but we should be careful about attaching too much weight to this result. That study uses a time series approach, which as we have seen in chapter two is likely to yield biased estimates of the ticket price elasticity.33

The small difference between the "all fan" ticket price elasticity and the "season ticket" price elasticity estimates in table 6.1 suggests that the season ticket and non-season ticket price elasticities are not significantly different (even given the 5.5 to one weighting to season ticket holders in column one). This in turn
suggests that the over-representation of season ticket holders in the Survey is not a matter of concern. However it is not possible to confirm this by estimating the ticket price elasticity solely for non-season ticket holders, due to the small number of non-season ticket holders in the Survey.

There are other sensitivity tests that need to be conducted. Our model assumes that substitution effects are insignificant. This is unavoidable due to the zonal framework but it is also my preferred assumption for the reasons given in chapter three. Substitution effects are likely to be insignificant since clubs possess a high degree of fan loyalty and the number of floating fans is likely to be small relative to the number of fans loyal to a particular club in a given season. Supporting evidence for this can be found in the 1995/96 National Fan Survey. Question 6b shows that only 16.6% of Premier League fans previously supported another “professional club” before their current club. However what if this assumption is incorrect?

Forrest et al (2000) showed that the bias from omitting significant substitution effects depends upon the spatial distribution of the rival sites. Their study applied a zonal travel cost model to the Royal Exchange Theatre in Manchester. The model excluded substitution effects on the grounds that the theatre offered a heterogeneous product and the rival theatres were evenly distributed throughout the North West. However it was pointed out that if the same

If the result from Simmons (1996) is true, then the “all fan” ticket price elasticity estimates in column one will underestimate the true “all fan” ticket price elasticity. The median ticket price elasticity in column one should be nearer to minus one than indicated, which would provide yet stronger evidence of profit maximisation.
model were applied to a theatre in the West End of London, then the estimate of
the ticket price elasticity would be biased downwards due to the high concentration
of theatres in the same area. Using a similar form of reasoning, we can determine
the likely direction of the bias from omitting significant substitution effects in our
zonal travel cost model.

Consider the following map of the 1995/96 Premier League clubs. From the
map it can been seen that there is a high concentration of clubs in the London area.
Outside London the nearest Premier League clubs are as far away as Southampton
and Coventry. This means that if we were to apply our modified travel cost model
(which excludes substitution effects) to one of the London clubs there would be a
positive correlation between travel costs to the study club and travel costs to rival
sites. This assumes that the rival sites consist only of other Premier League clubs.
As travel costs to the study club increase, travel costs to the substitute clubs also
increase. The estimates of the ticket price elasticity for the London club would be
biased downwards in absolute terms in a similar manner to the case of a
hypothetical West End theatre in Forrest et al (2000).

The effect works in the opposite direction for Bolton Wanderers. Whichever
direction one moves from Bolton Wanderers’ stadium moves one
closer to other Premier League clubs. To the north, we encounter Blackburn
Rovers. Moving to the east and north east brings one into the catchment areas of
Leeds United and Sheffield Wednesday. Manchester United and Manchester City
are located to the south and Everton and Liverpool are located to the south west.
The map was produced using a GIS computer package called MapInfo (professional version 4.5). The location of each club is determined from its postcode and the 1991 Census Digitised Boundary Data is reproduced under license from the Census Dissemination Unit at the University of Manchester.
As own travel costs increase, travel costs to rival clubs decrease. The effect is to bias Bolton Wanderers’ elasticity upwards in absolute terms (assuming that substitution effects are confined to the Premier League). The same may be true of Middlesbrough (if the population is concentrated to the north and south of the club), Southampton (if the population is concentrated to the east and north of the club) and Blackburn Rovers (to the east and south of the club).

However we should not be unduly concerned about these biases. In all of these cases (except Bolton Wanderers) revising the ticket price elasticity estimate moves its value nearer to minus one. For example, Arsenal has a ticket price elasticity of -0.59 under the core assumptions. If there are significant substitution effects between Premier League clubs, then this estimate should be revised upwards in absolute terms towards minus one. Thus significant substitution effects are unlikely to alter our core finding if the substitution effects are confined to the Premier League. The core results are also unlikely to change even if the substitution effects extend beyond the Premier League (e.g. to clubs in the lower divisions and other leisure attractions). In that case the rival sites are so numerous that there would be no systematic correlation between travel costs to the study site and travel costs to the rival sites; the core estimates of the ticket price elasticity would be unbiased.

As noted in chapter five, a number of the clubs are capacity constrained. This has the potential to bias estimates of the ticket price elasticity. The nature of the bias can be seen from the following diagram.
Attendance is measured on the horizontal axis and travel costs on the vertical axis. If a club is not capacity constrained then our model gives the effective demand curve $D_T$. However, if there is a high frequency of sell out games, the observed demand curve $D_O$ lies to the left of the effective demand curve $D_T$ since for games that are sold out we only observe capacity. We would also expect the observed demand curve to be steeper than the effective demand curve. Most tickets are sold to season ticket holders and are distributed by post. The fraction of successful applications is the same for every zone, but outer zones have a larger population than inner zones. Consequently the number of successful applications from the outer zones is greater than from the inner zones. The observed demand curve is nearer to the effective demand curve the higher the travel cost. In terms of the ticket price elasticity, the zonal model has a tendency to underestimate the ticket price elasticity.
Some authors overcome the downward bias in the ticket price elasticity at capacity constrained clubs using a Tobit model for a censored distribution rather than a normal distribution. (e.g. Kuypers 1996 and Welki and Zlatoper 1994). The Tobit model assumes that we observe the effective demand at minor games and uses these attendances to infer demand at games with a capacity crowd. However Forrest and Simmons (2002) argue that this is inappropriate. The possibility that a few games will be sold out alters the fan’s behaviour. Fans buy tickets to minor games to help gain admission to the most popular games. Entrance to event matches often depends upon producing ticket stubs from earlier games. There is a further problem with the Tobit approach. It is not known whether capacity is reached in a given zone, so the Tobit model cannot be expressed in terms of zonal observations.

Another approach to the capacity constraint issue is to include capacity as an explanatory variable in the demand equation (e.g. Dobson and Goddard 1992). However Demmert (1973) demonstrates that including a supply parameter in a demand equation introduces a simultaneous equation bias. It makes it difficult to interpret the coefficient on the capacity variable and the other coefficients. There is no convincing econometric solution to the capacity constraint issue. At best we can only note the direction of the bias. The bias, in fact, reinforces our core findings. The median ticket price elasticity under the core assumptions is −0.74. On account of capacity constraints this is too low in absolute terms. The actual ticket price elasticity is nearer to unity.
There is one remaining sensitivity test to conduct. A high proportion of a club's ticket sales originate in the first zone. For example, the first zone accounts for 41.3% of total predicted ticket sales at Manchester City and 24.8% of total predicted sales at Arsenal. This raises the possibility that a significantly different relationship would result if the first ring were excluded. To investigate this possibility we can examine the zone's leverage value. A leverage value is a test statistic that measures the influence of a single observation. A value above plus two indicates that an observation has an excessive influence on regression results. At none of the clubs is the leverage value for the innermost zone (or for any other zone) greater than plus two. The largest leverage value is 0.99 which occurs for the first ring surrounding Bolton Wanderers. As we would expect the leverage values tend to fall with distance from the club. For example in the first four rings around Aston Villa, the leverage values are 0.86, 0.40, 0.21 and 0.19 respectively. From this we can conclude that our results are not over-dependent on the influence of a single ring.

In this chapter we have considered how robust our results are to changes in the model's assumptions and the extent of various biases (the impact of substitution effects, capacity constraints and the high leverage of the first zone). In each case the initial conclusions stand. The estimates of the ticket price elasticity from the zonal travel cost model are more consistent with profit maximisation than previous estimates of the ticket price elasticity.

34 Details can be found in Greene (1997), page 445.
References


Chapter 7: Income elasticity of the demand for live soccer - revisited

The results in chapter five suggest that soccer is a normal good. Holding other factors constant, zones with a high proportion of the population in social classes one and two buy more tickets per capita than zones with a lower proportion in social classes one and two. The effect is significant for eight of the 1995/96 Premier League clubs at the 10% level. However, while this is very suggestive that soccer is a normal good, it is not conclusive as social class is only a proxy for income and the finding is based on a small number of zones.

The inefficiency of the zonal model was discussed in chapter three. It has been argued that estimates from the individual travel cost model would be more efficient (i.e. have lower standard errors) than estimates from the zonal travel cost model, since the number of observations on individual visitors is typically greater than the number of zones. However, only the zonal model can provide valid estimates of an elasticity. The National Fan Survey excludes non-participants so the individual model can show only the responsiveness of current fans to changes in an explanatory variable. This is not the same as an elasticity, which shows the responsiveness of both non-participants and current fans to changes in an explanatory variable.

In this chapter we investigate whether soccer is a normal good or an inferior good using both the individual and the zonal model. This is a stronger test of the sign of the income elasticity than was possible using only the zonal model.
An individual's consumption of soccer is divided into two parts: the decision to become an active fan (in the sense of attending live games) and, given that one is an active fan, the question of the number of games to attend during a season.\(^{35}\) The effect of income on the decision to become a fan is examined using an approach equivalent to the zonal model and the effect of income on the frequency of attendance among fans is then examined using the individual model.

In this way we can determine whether the income elasticity of demand for live soccer is positive or negative. For example, if the zonal model shows that increasing income raises the likelihood of being a fan and the individual model shows that, conditional on being a fan, increasing income raises frequency of attendance, then it can be concluded that live soccer has a positive income elasticity of demand. This outcome is not guaranteed. The two elements may conflict, but nevertheless the information on the income elasticity that emerges (positive, negative, indeterminate or zero) will be more compelling than before due to the addition of the individual travel cost model.

As before, data on non-participants is obtained from the 1991 Census. Most of the population do not attend live games, so the Census is a good source of data on non-participants. However information on fans is obtained from the more recently available 1998/99 F.A. Premier League National Fan Survey, rather than the 1995/96 Survey in chapter four. A summary of the 1998/99 responses is given

\(^{35}\) From this point onwards the term fan will refer to an active fan, in other words a supporter who attends live games, as opposed to a passive fan who does not attend live games.
in the following table and a copy of the full 1998/99 questionnaire is given in appendix three.

Table 7:1 Summary of the 1998/99 F.A. Premier League National Fan Survey

(Number of responses with a valid postcode)

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<thead>
<tr>
<th>Club</th>
<th>NSTH</th>
<th>STH</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenal</td>
<td>166</td>
<td>367</td>
<td>533</td>
</tr>
<tr>
<td>Aston Villa</td>
<td>69</td>
<td>330</td>
<td>399</td>
</tr>
<tr>
<td>Blackburn R.</td>
<td>121</td>
<td>553</td>
<td>674</td>
</tr>
<tr>
<td>Charlton A.</td>
<td>1</td>
<td>589</td>
<td>590</td>
</tr>
<tr>
<td>Chelsea</td>
<td>103</td>
<td>274</td>
<td>377</td>
</tr>
<tr>
<td>Coventry City</td>
<td>89</td>
<td>339</td>
<td>428</td>
</tr>
<tr>
<td>Derby County</td>
<td>24</td>
<td>322</td>
<td>346</td>
</tr>
<tr>
<td>Everton</td>
<td>26</td>
<td>327</td>
<td>353</td>
</tr>
<tr>
<td>Leeds United</td>
<td>84</td>
<td>478</td>
<td>562</td>
</tr>
<tr>
<td>Leicester City</td>
<td>36</td>
<td>606</td>
<td>642</td>
</tr>
<tr>
<td>Liverpool</td>
<td>104</td>
<td>174</td>
<td>278</td>
</tr>
<tr>
<td>Manchester U.</td>
<td>120</td>
<td>476</td>
<td>596</td>
</tr>
<tr>
<td>Middlesbrough</td>
<td>67</td>
<td>668</td>
<td>735</td>
</tr>
<tr>
<td>Newcastle U.</td>
<td>154</td>
<td>625</td>
<td>779</td>
</tr>
<tr>
<td>Nottingham F.</td>
<td>71</td>
<td>533</td>
<td>604</td>
</tr>
<tr>
<td>Sheffield W.</td>
<td>150</td>
<td>465</td>
<td>615</td>
</tr>
<tr>
<td>Southampton</td>
<td>216</td>
<td>620</td>
<td>836</td>
</tr>
<tr>
<td>Tottenham H.</td>
<td>114</td>
<td>520</td>
<td>634</td>
</tr>
<tr>
<td>West Ham</td>
<td>237</td>
<td>282</td>
<td>519</td>
</tr>
<tr>
<td>Wimbledon</td>
<td>15</td>
<td>396</td>
<td>411</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1967</strong></td>
<td><strong>8944</strong></td>
<td><strong>10911</strong></td>
</tr>
</tbody>
</table>

The format of the 1998/99 Survey is generally the same as the 1995/96 Survey. Seventeen of the clubs from the 1995/96 Survey are included in the
However, there are two differences to note between the two Surveys. When distributing the 1998/99 questionnaires the Centre for Football Research had a preferred ratio of two season ticket holders for every one non-season ticket holder to reflect the average home gate. The actual ratio of season ticket holders to non-season ticket holders in the 1998/99 Survey is 4.5:1. Back in 1995/96 the preferred ratio was 2:1 and the actual Survey ratio was 5.5:1. Thus the degree of season ticket over-representation is slightly less pronounced in the 1998/99 Survey than in the 1995/96 Survey. The other difference between the two Surveys concerns the postcodes. The Centre for Football Research coded all of the postcodes from the 1998/99 Survey but did not code the postcodes from the 1995/96 Survey. As a result the postcodes were used to allocate the 1998/99 respondents into zones.

To some extent the effect of income on the decision to become a fan is already known. In recent years there has been much discussion on "social exclusion" in English soccer. Social exclusion is a vague term but it generally refers to the exclusion of lower income groups from a popular cultural activity or, in this case, from attendance at soccer matches. The European Statistical Agency, Eurostat, defines social exclusion as "the link between low income, activity status and disadvantages regarding monetary and non-monetary aspects of life" (European Communities (2000), page 7). The Football Task Force, for example, has proposed that poorer people are being excluding from attending live games.

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36 Bolton Wanderers, Manchester City and QPR did not carry over to the 1998/99 survey, having been relegated. The new clubs were Charlton Athletic, Derby County and Leicester City.
we accept that this is so, then it would suggest that increasing a person's income increases the likelihood of his or her being a fan, and therefore the income elasticity of demand for soccer is positive with regards to the decision to become an active fan.

There are indications of social exclusion in the responses to the 1998/99 National Fan Survey. Question 31 of the 1998/99 Survey asked fans "if you are in full time work, how much do you earn?", to which fans ticked one of the following: £10000 or below, £10001-£15000, £15001-£20000, £20001-£25000, £25001-£30000 and, finally, over £30000 per annum. Seventy three percent of fans in the entire Survey answered the question on income and, out of these, the largest proportion of fans ticked the highest income group.

The New Earnings Survey shows that at the time the 1998/99 Survey was conducted, the average adult in Great Britain earned a gross income of £22,386.38. This is considerably lower than the earnings of the typical fan in the fan Survey. Thus the average adult in Great Britain would fall into the fourth income category, two categories below the modal fan in the Survey. Based on this evidence, high-income earners are over represented in the fan base.

37 Table 7.1 shows the number of responses with a valid postcode. On average three in every ten respondents did not give a postcode and one in every ten gave a postcode that was not recognised by the Post Office Central Postcode Directory.
38 This figure is derived from the New Earnings Survey, April 1999, part E, tables A21-A23, average gross annual earnings for full-time employees on adult rates. My calculation weights national male and female earnings by the proportions of male and female respondents in the soccer fan aggregate data (85.2% male).
There are also strong signs of social exclusion if we examine the social class of the fans. Question 30b on the National Fan Survey is used to allocate fans between the five standard social classes. Social class one represents occupations paying the highest income, that is professional occupations such as doctors and executives. Social class two includes managerial and technical jobs whilst social class three represents non-manual or manual skilled occupations. People who are employed in partly skilled jobs belong to social class four. Unskilled workers like labourers, porters and dockers are grouped under social class five.

Table 7.2 shows for each club, the proportion of fans in social classes one and two and the proportion of fans in social classes three and four from the entire Survey. The clubs are ranked based on the difference between the percentage of fans in social classes one and two and the percentage of fans in social classes three and four. As a point of comparison, the table also shows the social class percentages for the population of Great Britain, from table ninety of the 1991 Census.

For the majority of the clubs (eleven out of twenty), social classes one and two account for a bigger proportion of the home crowd than social classes three and four. Moreover, at the other nine clubs, social classes one and two still represent a significant proportion of the home crowd, more than we would observe in the general population. The club with the largest proportion of professionals
and managers is Chelsea followed by Manchester United. The largest proportion of fans in social classes three and four is found at Everton and Aston Villa.39

Table 7.2: % of fans in social classes

<table>
<thead>
<tr>
<th>Club</th>
<th>%SCL12</th>
<th>%SCL34</th>
<th>%DIFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chelsea</td>
<td>64.8%</td>
<td>33.7%</td>
<td>31.1%</td>
</tr>
<tr>
<td>Manchester U.</td>
<td>64.1%</td>
<td>33.6%</td>
<td>30.5%</td>
</tr>
<tr>
<td>Tottenham H.</td>
<td>62.8%</td>
<td>36.1%</td>
<td>26.7%</td>
</tr>
<tr>
<td>Wimbledon</td>
<td>61.6%</td>
<td>36.7%</td>
<td>24.9%</td>
</tr>
<tr>
<td>Blackburn R.</td>
<td>56.2%</td>
<td>40.9%</td>
<td>15.3%</td>
</tr>
<tr>
<td>Nottingham F.</td>
<td>54.9%</td>
<td>41.1%</td>
<td>13.8%</td>
</tr>
<tr>
<td>Arsenal</td>
<td>52.8%</td>
<td>47.0%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Coventry City</td>
<td>51.9%</td>
<td>47.4%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Charlton A.</td>
<td>50.1%</td>
<td>48.1%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Newcastle U.</td>
<td>48.6%</td>
<td>47.2%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Leeds United</td>
<td>49.3%</td>
<td>48.2%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Derby County</td>
<td>48.0%</td>
<td>50.2%</td>
<td>-2.2%</td>
</tr>
<tr>
<td>Leicester City</td>
<td>47.8%</td>
<td>50.1%</td>
<td>-2.3%</td>
</tr>
<tr>
<td>West Ham</td>
<td>45.5%</td>
<td>51.3%</td>
<td>-5.9%</td>
</tr>
<tr>
<td>Liverpool</td>
<td>45.2%</td>
<td>51.3%</td>
<td>-6.1%</td>
</tr>
<tr>
<td>Southampton</td>
<td>41.4%</td>
<td>51.4%</td>
<td>-9.9%</td>
</tr>
<tr>
<td>Middlesbrough</td>
<td>41.8%</td>
<td>54.7%</td>
<td>-12.9%</td>
</tr>
<tr>
<td>Sheffield W.</td>
<td>39.7%</td>
<td>55.1%</td>
<td>-15.4%</td>
</tr>
<tr>
<td>Aston Villa</td>
<td>38.8%</td>
<td>60.1%</td>
<td>-21.3%</td>
</tr>
<tr>
<td>Everton</td>
<td>35.8%</td>
<td>57.2%</td>
<td>-21.4%</td>
</tr>
</tbody>
</table>

Social exclusion from professional sport is not unique to English soccer. For example, Siegfried and Peterson (2000) found that the median income of respondents who had purchased tickets to sport events was 84% higher than the

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39 We are assuming that the 1998/99 National Fan Survey is representative of fans in terms of their income, i.e. that fans of higher income or social class are not just more likely to respond to the survey.
median income of all respondents to the 1994 Consumer Expenditure Survey of the US Bureau of Labor Statistics. The term "sports events" here includes professional and amateur baseball, basketball, hockey and American football.

However great care needs to be taken in relating pronouncements about "social exclusion" in English soccer to the income elasticity of demand. When discussing the income elasticity it is essential to do two things. First, it is important to consider the soccer clubs individually as the effect of income can vary from club to club. This is apparent from the variation between clubs in the previous table. Therefore a national perspective may be misleading. When comparing the income of the soccer fans and the income of the population based on the National Earning Survey, it would have been more revealing to have looked at the clubs separately. For example, at Manchester United the modal fan ticked the "over £30,000" income bracket, and in April 1999 the average person in Greater Manchester earned £20,932 (weighted according to the proportions of males and females in the aggregate data from the National Fan Survey). Thus Manchester United fans are on average two income brackets higher than the regional average. This is in contrast to Everton and Sheffield Wednesday. For these two clubs, the modal fan is one income bracket lower than the regional average. Social exclusion is more acute at some clubs than others.

Secondly, it is important to hold other factors constant. The income elasticity is a ceteris paribus concept, so when evaluating the income elasticity other relevant factors must be held constant. This is not true of the club-by-club
data on social class in table 7.2. The percentages in the table are the product of a number of factors such as the social class of the population in a club’s catchment area and the income effect.

For example, Liverpool and Everton are both based in Merseyside, which is one of the poorest areas of England. As a result, Everton is at the bottom of the table in the sense of attracting the most "democratic" group of spectators. However the positive income effect is strong enough at Liverpool to propel the club up the table. The London clubs tend inevitably to have a higher proportion of fans in social classes one and two than the northern clubs, due to a different occupational structure in the south.

Travel distance is a key variable for which we must control when assessing the income elasticity. The decision to become a fan is influenced not only by personal income but also by the distance that individuals would have to travel to home matches. Higher travel costs further from the stadium deter people from becoming fans and areas nearer to the stadium tend to have a higher affinity for the club; as a result more fans are observed nearer to the stadium. This distance effect may in fact dilute the income effect. Most football clubs are located in inner city areas so it may be cheaper for poorer people to attend matches, in terms of travel costs, than more affluent people.

Therefore in order to assess the true income elasticity of demand we controlled for distance, using an approach equivalent to the zonal travel cost
model. The catchment area of each of the 1998/99 F.A. Premier League clubs was divided into six concentric rings based on the fans' postcodes. The first five rings each have a radius of three miles and the final ring has a radius of six miles to allow for the decline in attendance further from the stadium. An example of the ring structure is shown below for Manchester United. The cut-off point of twenty-one miles captures on average 74% of the fans of each club in the survey. The effect of income on the decision to become a fan can be determined by comparing the income of the fans in each ring with the income of the population in the same ring. Comparing the fans and the population in a ring holds other relevant factors constant, since everyone living in a particular ring has approximately the

\[40\]

There are fewer rings than before since we have a smaller sample of fans and consequently outer rings would need to be very wide in order to capture an adequate number of fans in each ring. The rings in figure 7.1 are drawn around multiples of three miles rather than multiples of five miles by virtue of using straight-line distances to allocate the fans into rings. It is no longer necessary to contend with fans rounding their reported distance to the nearest five miles.
same travel cost and the degree to which the club is regarded as local should also be the same. Fans also pay the same ticket prices regardless of where they live.

It is not possible to compare the fans and the population in terms of their actual income since the geographical regions in the New Earning Survey are too large to be aggregated into such rings. So, as the next best alternative, the two groups (participants and non-participants) were compared in terms of social class using data from the 1998/99 National Fan Survey and the 1991 Census respectively. Aggregating enumeration district data on social class from table ninety of the Census gave the percentage of the population in each ring belonging to the different social classes. Linking the data on fan social class from question 30b to the fan postcodes gave the percentage of fans in each ring belonging to the various social classes.

There are other variables in the 1991 Census that are correlated with income. For example, Williamson and Voas (2000) evaluated the use of Census-based measures as proxies for income and concluded that, "By common consensus these include car ownership, the occupation based measure of 'social class', employment status and household tenure. These indicators, either singly or in combination, have been used to underpin many studies into the impacts of (income) inequalities". However, the other variables besides social class are not suitable for comparing the fans and the population. There are no questions on car ownership and household tenure in the fan Survey and the questions on employment and education in the fan Survey are coded in a different manner from
in the Census. Social class is the only proxy for income in the Census with an equivalent question on the 1998/99 National Fan Survey.

*Figure 7.2* shows the percentage of the zonal fans and the percentage of the zonal population in social classes one and two for each club based on the chosen ring structure. Distance is measured on the horizontal axis from the mid-point of each ring. There are six values for the National Fan Survey, one for each ring, represented as black squares joined by a solid line, and six values for the Census, shown as white triangles joined by a dashed line.

From the graphs we can see that there is typically a much higher percentage of fans in social classes one and two than for the general population living in the same ring. For example, consider the case of Nottingham Forest. In the first ring surrounding Nottingham Forest’s stadium, 60.4% of the Forest fans belong to social classes one and two compared to 36.3% of the population. Within the ring nine to twelve miles from the stadium, 60.0% of the Forest fans and 37.0% of the population belong to social classes one and two. On average there is a 19.7% gap between the percentage of Forest fans in social classes one and two and the percentage of the population in social classes one and two across the six rings. The average gap for all of the clubs is 14.5% ranging from 30.1% at Manchester United to 2.0% percent at Southampton. The mean gap across all clubs is significant at the five percent level. Out of the 120 rings (6 rings for each of the twenty clubs) there are only seven cases where the proportion of the zonal fans in social classes one and two is less than the population proportion.
Figure 7.2: % of the zonal fans/population in social classes 1 and 2

- - - - - Fan Survey
- - - - - Census

Arsenal

Aston Villa

Blackburn Rovers

Charlton Athletic

Chelsea

Coventry City

Derby County

Everton

Leeds United

Leicester City
% of the zonal fans/population in social classes 1 and 2

Fan Survey

Census

Liverpool

Manchester United

Middlesbrough

Newcastle United

Nottingham Forest

Sheffield Wednesday

Southampton

Tottenham Hotspur

West Ham United

Wimbledon
Figure 7.3 shows the percentage of the zonal fans in social classes three and four and the percentage of the zonal population in social classes three and four, for all of the clubs, based on the same ring structure as in figure 7.2. No graph is presented for social class five as only a tiny proportion of fans belong to social class five (2.9% of the fans in the entire Survey). The data show that there tends to be a significantly lower percentage of the fans in social classes three and four than for the population at a given distance from the club. The average gap for all of the clubs between the fans and population is –11.2%, ranging from –25.5% at Manchester United to –0.2% percent at Aston Villa. The mean gap across all of the clubs is significant at the ten percent level.42

By controlling for distance, the previous graphs cast light on the pure income elasticity of demand. The overall impression is that soccer is a normal good with regards to the decision to become an active fan (the income effect is positive). Fans have higher ranked jobs than the population in each ring. Social classes one and two have a higher propensity to be a fan than social classes three and four, holding other factors constant. Therefore, given that higher status jobs are better paid in general, we can conclude that soccer has a positive income elasticity of demand; increasing a person’s income increases the likelihood of him or her becoming an active fan, holding other factors constant.

41 The null hypothesis is that the mean gap for all of the clubs is zero and the alternative hypothesis is that the mean gap is greater than zero. Under the null hypothesis, the test statistic follows a t distribution with nineteen degrees of freedom. The test statistic is given by the mean for all of the clubs (14.5%) divided by the sample standard deviation.
42 The alternative hypothesis is now that the mean gap is less than zero.
Figure 7.3: % of the zonal fans/population in social classes 3 and 4

- - - - - Fan Survey
--- --- --- Census

- - - - - Arsenal
- - - - - Blackburn Rovers
- - - - - Chelsea
- - - - - Derby County
- - - - - Leeds United

- - - - - Aston Villa
- - - - - Charlton Athletic
- - - - - Coventry City
- - - - - Everton
- - - - - Leicester City

134
% of the zonal fans/population in social classes 3 and 4

- - - - - Fan Survey
- - - - - Census

Liverpool

Manchester United

Middlesbrough

Newcastle United

Nottingham Forest

Sheffield Wednesday

Southampton

Tottenham Hotspur

West Ham United

Wimbledon
This does not however, necessarily mean that most fans in a stadium are professional and managers. As table 7.2 shows, social classes three and four still represent more than fifty percent of the total fan base at nine clubs. The apparent paradox arises because the soccer stadia are mainly located in low social status, inner city areas. It should also be borne in mind that the fan proportions in the graphs are relative to the populations in a particular ring.

When interpreting the graphs, it is important to be aware of the time difference between the 1998/99 National Fan Survey and the 1991 Census. The proportion of the population in social classes one and two may have increased between 1991 and 1998/99, which would mean that we have exaggerated the positive income effect. This may be the case but it is difficult to prove or disprove. No data are available on the change in the social class composition of the population between 1991 and 1998/99.

At best we can obtain only a crude indication by considering the change in national earnings over the same period. An increase in the earnings of professional occupations may coincide with a directly proportional increase in the fraction of the population in those occupations if the cause is an increase in the demand for labour. The UK economy grew over the 1990s so it is possible that the demand for professionals increased. The New Earning Survey shows that real average gross earnings increased by 8.8% for people working in professional occupations in Great Britain between 1991 and 1999. If we uniformly increase the proportion of the zonal population in social class one and two in figure 7.2 by 8.8%, there is still
a substantial positive income effect at many of the clubs. This suggests that the graphs are not overly sensitive to the timing of the 1991 Census. While this does not completely eliminate concern over the time lapse between the latest 1991 Census and the 1998/99 Survey, we can be generally confident. In order for the average club to have a zero income effect the proportion of the zonal population in social classes one and two would have to have increased by 14.5%, which seems inordinately high for eight years and given the probable inelastic supply of professionals and managers.

We also need to be aware of the over-representation of season ticket holders in the 1998/99 Survey, even though the over-representation is less pronounced than with the 1995/96 Survey. The over-representation of season ticket holders in the 1998/99 Survey may bias the previous results if the social class profile of season ticket holders differs from that of non-season ticket holders. For example, if there is an over-representation of season ticket holders in the sample and season ticket holders are more affluent than non-season ticket holders, this would mean that figure 7.2, which relates to all fans, may over estimate the proportion of all fans in social classes one and two.

To investigate this matter, we calculated the proportion of fans in the different social classes, separately for season ticket holders and non-season ticket holders in the 1998/99 Survey.

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43 In April 1991 males and females professionals earned on average £427.70 and £336.30 per week respectively on adult rates within Great Britain (from Part E of the New Earnings Survey). By April 1999 this had risen to £584.3 for males and £477.2 for females. Weighting males and females earnings at National Fan Survey proportions (0.852 males and 0.148 females) and deflating by the RPIX gives an overall increase in real earnings of 8.8% over this period. It is not possible to match the definition of social class two in the 1991 Census to the occupational definitions in the New Earnings Survey, so attention is confined to professional occupations.
holders. Figure 7.4 shows the percentage of season ticket holders in social classes one and two as well as the percentage of non-season ticket holders in social classes one and two against distance from the stadium. The same ring structure is used for season ticket holders as before, but there are only four rings for non-season ticket holders, to allow for the smaller number of non-season ticket holders in the sample. The first three rings for non-season ticket holders each has a radius of five miles and the fourth ring has a radius of ten miles. Graphs are presented for clubs with more than one hundred non-season ticket holders in the sample as in table 7.1: Arsenal, Blackburn Rovers, Chelsea, Liverpool, Manchester United, Newcastle United, Sheffield Wednesday, Southampton, Tottenham Hotspur and West Ham United. Figure 7.4 also shows for the same clubs, the proportion of season ticket holders and non-season ticket holders in social classes three and four against distance from the stadium.

Comparing the "NSTH" and the "STH" schedules, we can see that there is no obvious systematic difference between non-season ticket holders and season ticket holders, in terms of social class at the ten clubs. Therefore the result that soccer is a normal good with regards to the decision to become a fan is not an artifact of the sampling process.
Figure 7.4:

% of the zonal fans in social classes 1 and 2

% of the zonal fans in social classes 3 and 4
Figure 7.4:

% of the zonal fans in social classes 1 and 2

% of the zonal fans in social classes 3 and 4
Perhaps the only exception to this finding is Newcastle United. It is the only club where there is a consistent difference between season ticket holders and non-season ticket holders in terms of social class. Its non-season ticket holders are seemingly more affluent than its season ticket holders. The Newcastle sample is also unusual in that it over-represents non-season ticket holders compared to the club's ticket allocation. Overall this would mean that the previous results make the average Newcastle fan appear more affluent that is in fact the case. The positive income effect for Newcastle may be weaker than previously indicated.

It is also interesting to point out another feature of the graphs. In figure 7.3 we can observe that, as we move further from the stadium, the proportion of the zonal population and the proportion of the zonal fans in social classes three and four both tend to decrease, but the fan proportion tends to decrease at a faster rate. The proportion of the population in social classes three and four and the fan proportion tend to be close for the innermost ring but the gap then increases. This is most apparent at Tottenham Hotspur and Wimbledon. This is probably because poorer people, living in the outlying areas of a club's catchment area, cannot afford the relevant travel costs to a soccer game and public transport may not be convenient from such locations.

Social exclusion has previously been blamed on high ticket prices and the move to all season ticket stadia. Over the past ten years, the prices of match-day

44 Newcastle and Middlesbrough had all season ticket stadiums in 1995/96. However, in 1998/99 the two clubs each had a very small number of non-season ticket holders (approximately 3% and 6% respectively of their average home support), according to Williams (1999).
tickets in the Premier League (and the First Division beforehand) have increased by four times the rate of inflation, whilst cinema tickets for example, have risen in line with inflation.\textsuperscript{45} The increase in the ticket price may have deterred poorer people from attending live games. Since the early 1990s there has also been a tendency for clubs to offer an increasing proportion of seats to season ticket holders, so that by 1998/1999 season ticket holders accounted for two thirds of the home gate at the typical Premier League club. The increasing emphasis on season tickets may have deterred poorer people from attending games, as buying a season ticket may represent more of a financial burden than buying tickets to individual matches, especially if a person has limited access to credit.

However, the previous graphs suggest that high travel costs and limited access to transport may be the root cause of social exclusion from Premier League matches. At many clubs, the social composition of that part of the crowd living relatively close to the ground mirrors that of the population as a whole in the same area; but amongst those living further away, the deterrent effect of distance appears more pronounced for those in "lower" social groups. To reduce social exclusion from this source, clubs may wish to consider subsidising travel costs, perhaps by provision of transport facilities from outlying parts of their catchment areas. At present the clubs do not subsidise travel costs, although supporter groups may reduce unit costs of travel through scale economies (e.g. booking large coaches for members). It is necessary to re-evaluate the causes of social exclusion. Figure 7.4 does not lend empirical support to the view that social exclusion is attributable to

\textsuperscript{45} See Boon (2000).
the move to all season ticket stadia; season ticket holders and non-season ticket holders are shown to have a similar social class profile.

Taken together the various graphs show that that increasing income raises the likelihood of being a "primary" fan, holding other factors constant. To determine the effect of income on the frequency of attendance among fans, we estimated the following model. In this model the subscript \( i \) refers to an individual fan.

**Probit selection mechanism**

\[
\text{Sticket}_i = \alpha_1 + \alpha_2.\text{Income34}_i + \alpha_3.\text{Income56}_i + \alpha_4.\text{MissEmp}_i + \alpha_5.\text{MissOth}_i + \alpha_6.\text{A3140}_i + \alpha_7.\text{A4150}_i + \alpha_8.\text{A51Plus}_i + \alpha_9.\text{Univ}_i + \alpha_{10}.\text{Vdistmil}_i + \alpha_{11}.\text{Newfan}_i
\]

**Least squares Regression Model** (observed only if \( \text{Sticket}_i = 0 \))

\[
\text{Freqatt}_i = \beta_1 + \beta_2.\text{Income34}_i + \beta_3.\text{Income56}_i + \beta_4.\text{MissEmp}_i + \beta_5.\text{MissOth}_i + \beta_6.\text{A3140}_i + \beta_7.\text{A4150}_i + \beta_8.\text{A51Plus}_i + \beta_9.\text{Univ}_i + \beta_{10}.\text{Vdistmil}_i + \beta_{11}.\lambda_i
\]

This is similar to the standard individual travel cost model outlined in chapter three but with one important difference. The standard individual model consists of one equation relating the frequency of attendance among participants to individual specific factors. However, in this application not one but two equations are estimated to distinguish between season and non-season ticket holders.
Season ticket holders tend to go to most of the home games in the season with little variation across fans, while non-season ticket holders tend to go to far fewer games, and exhibit a greater variation in the number of visits. For example, question 1 of the 1998/99 National Fan Survey asked fans how many home games they attend in the season. Fans indicated whether they attended "1-5" home games, "6-10", "11-15", "16-20" or "All home games". The modal season ticket holder ticked the "All" category with a standard deviation of 0.59 categories. In contrast the modal non-season ticket holder ticked the "6-10" category with a standard deviation of 1.33 categories.

Due to this difference, it would be misleading to estimate the frequency of attendance across both sets of fans in one equation, since this would ignore the difference between the two sets of fans. One option would be to include a season ticket dummy variable but this would not allow for possible differences in slope coefficients. The best approach is to estimate two equations that distinguish between season ticket holders and non-season ticket holders.

The first equation predicts the probability of being a season ticket holder \((Stticket)\) conditional on being a fan. The probability of being a season ticket holder is estimated rather than the frequency of attendance among season ticket holders since the latter would have a low power due to the small variation in attendance among season ticket holders. As the dependent variable is a probability, this equation is estimated across season ticket holders and non-season ticket holders, as in table 7.1. The second equation predicts the frequency of attendance of non-
season ticket holders \( (Freqatt) \), and is estimated across non-season ticket holders in the sample.

With the first regression we are interested in whether high income groups are more likely than low income groups to be season ticket holders (given that they attend at all). With the second regression we are interested in whether, amongst non-season ticket holders alone, high income groups attend more often than low income groups. If this is true, in both cases, then we can conclude that the frequency of attendance among fans is positively related to income (given that season ticket holders attend more often than non-season ticket holders).

Whether a fan is a season ticket holder \( (Sticket) \) is known from question 3b of the 1998/99 National Fan Survey and the frequency of attendance among non-season ticket holders \( (Freqatt) \) is known from question 1. Each response to question 1 is represented by its midpoint. For example "6-10" home games is taken to mean eight games. The category "All" home games is taken to include all F.A. Cup and Coca Cola Cup home games in the season, in addition to the nineteen Premier League games.

The model specifies that the probability of being a season ticket holder and the frequency of attendance among non-season ticket holders, depend upon income as represented by dummy variables constructed from answers to question 31: \( Income34 \) and \( Income56 \). The dummy variable \( Income34 \) represents the income range £15,001 to £25,000 per annum and \( Income56 \) represents fans earning over
£25,000 per annum. Incomes of £15,000 per annum or below are captured by the constant term. Question 31 specifies six income groups but these are combined into three groups owing to the small number of non-season ticket holders in the sample. The dummy variable (MissEmp) equals one for fans not answering the income question even though they are employed and the question specifies that they should answer if they are in full time work. Fans not answering the income question because they are not employed are represented by the dummy variable (MissOth).

The probability and frequency also depend upon three age dummy variables for the age ranges 31-40, 41-50 and 51 and over from question 28a (A3140, A4150, A51plus), an education dummy variable from question 30c (Univ) and a fan’s straight line distance to his club’s stadium based on his postcode (Vdistmil). Fans under thirty years are excluded from the model, since including all of the age groups as well as the constant would have resulted in two columns entirely consisting of ones and hence perfect multicollinearity.

The variable (Vdistmil) has not been translated into a monetary cost. This is because this would involve making extra assumptions, for instance about the petrol costs per mile and the value of time. The travel cost assumptions introduce a potential bias into the regression, so it would then be necessary to conduct a sensitivity test to observe the extent of the bias. Here the distance variable is not assigned a monetary cost to avoid this requirement. It is essential to have monetary travel costs in the model when estimating the price elasticity, but it is not when
estimating the income elasticity; what is held constant is the price of travel in units of distance rather than units of money.

The model does not include the distance from the fan's home to substitute sites, for the same reasons that were advanced in chapter three: the limited economic competition between soccer clubs for primary supporters and the limited competition from other leisure pursuits. Also substitute attractions are likely to be less important for someone already attending matches than for someone considering attending for the first time. The model does not include a measure of fan's taste on the right hand side of the equation since this would lead to simultaneity problems; the very act of being a season ticket holder may signal a fan's strength of interest in soccer. The ticket price is reflected in the constant since the price differential between a season ticket and a match ticket is the same regardless of the distance that fans travel to a match.

Fans choose to be non-season ticket holders, so there is a possibility that the sample of non-season ticket holders may not be an entirely random sample. To allow for this, the two equations are jointly estimated within a Heckman selection model. Fans are selected for the second regression if the probability of being a season ticket holder is zero in the first stage; that is, only non-season ticket holders advance to the second stage. The Heckman selection model is a widely used technique. For example it has been applied to hours-worked (e.g. Heckman 1976), football player transfer payments (Carmichael, Forrest and Simmons 1997) and the
demand for lottery tickets (Farrell and Walker 1998), but this is the first time that it has been applied to the frequency of attendance amongst soccer fans.

A key element in any Heckman selection model is finding a variable, or variables, that influence the probability of being selected but can be excluded from the second stage regression (see Heckman 1990). For example, in the Farrell and Walker (1998) lottery study, it is assumed that car ownership increases the probability of buying a lottery ticket but it does not influence the demand for lottery tickets conditional on participation.

In this case, whether an individual is a new fan (from question 5) is used as an instrument for the probability of being a season ticket holder. The prior expectation is that if the individual is a new fan (i.e. he or she started attending matches only in the last five years) then this should reduce the probability of being a season ticket holder but not affect the frequency of attendance among non-season ticket holders. This can be attributed to the waiting list system for season tickets. A new fan may not be on the waiting list for long enough to be eligible for a season ticket. It may also be that new fans attend soccer matches for a trial period. They may not be willing to make the commitment of buying a season ticket but this does not constrain the number of times that they wish to buy individual match tickets.

This was subsequently confirmed by testing. The variable \textit{Newfan} is always significant (with a negative coefficient) in the first regression and with the exception of one club, it is never significant in the frequency of attendance
regression. One could think of other questions in the fan Survey that might supply plausible instruments, such as "do you currently follow or support another football club?" (question 6a), but they proved to be significant in both the first regression and the frequency of attendance regression.

The Inverse Mills Ratio $\lambda$ in the frequency of attendance regression corrects for any sample selection bias. It is derived from the first regression. The coefficient on $\lambda$, multiplied by the value of $\lambda$, equals the expected value of the error term in the second regression. If there is no sample selection bias to begin with, then the error term has a zero mean and $\lambda$ is insignificant.

The probability of being a season ticket holder conditional on participation is estimated as a probit model and the frequency of attendance among non-season ticket holders is estimated using least squares, as is standard practice when estimating the Heckman selection model. It could be argued that the second regression should not be estimated using least squares. The underlying frequency of attendance is truncated at one and it is a count (1,2,3...). However, least squares can predict continuous and negative visits due to the normality assumption. Efficiency may be improved by using a count estimator such as a Poisson count model to estimate the second regression. Alternatively, we may wish to overcome the truncation bias by using truncated maximum likelihood. The density function for the dependent variable would then be the density function for the standard normal, when the number of visits is greater than zero, but otherwise the density function would be zero. If we do not wish to specify an error distribution we could
opt for the non-parametric Generalised Method of Moments estimator for a truncated regression.\textsuperscript{46}

These estimators have been used in other applications of the individual travel cost model. For example, Fix, Loomis and Eichhorn (2000) used a Poisson estimator and Willis and Garrod (1991) and Bateman et al (1996) both used truncated maximum likelihood to estimate an individual travel cost model. Lee and Lee (1997) developed the GMM estimator and applied it to an individual travel cost model of saltwater anglers in the Bay Area of California. Some studies have found that the choice of estimator is important (e.g. Willis and Garrod (1991)) but others have found that it does not significantly affect the estimates (e.g Balkan and Kahn (1988) and Smith (1998)).

When considering the choice of estimator for the frequency of attendance, it is important to consider a point made by Smith, Desvousges and McGivney (1983) about the bias from using OLS: "the magnitude of the bias will depend upon the distribution of the visits to the site. If the average number of trips to the site is large and the variance is small, we can expect the truncation at one to have little impact on the estimates" (page 273, footnote 14). Most visitors to an environmental site may make only one or two trips to the site during the season, so in that case it is advisable to use an estimator such as a Poisson count model. However the typical non-season ticket holder attends six to ten home games in the

\textsuperscript{46} For further details on the Poisson model, truncated maximum likelihood and GMM estimation see pages 931-946, 949-958 and 517-531 respectively of Greene (1997).
season, so the bias from using least squares will be limited. Consequently least squares is used to estimate the second stage regression.

The results from the model are given in table 7.3. Experimentation indicated that in order to obtain a jointly significant second regression, a club had to have a minimum of one hundred and fifty non-season ticket holders in the sample. Therefore results are presented only for clubs that have at least this number of non-season ticket holders in the sample: Arsenal, Newcastle United, Sheffield Wednesday, Southampton and West Ham. This is less than the number of clubs in figure 7.4 because those graphs have just one variable (distance) but this model has several variables.

The coefficients in the first regression are marginal effects. For example the number 0.314 for Sheffield Wednesday, under the constant, means that the residual group (fans earning less than £15,000 per annum and aged less than thirty years) have an estimated probability of 0.314 of being a season ticket holder, conditional on being a fan. The other income and age dummy variables show how this probability changes if a fan falls into another income or age group. The university and new fan dummy variables show the change in the probability of being a season ticket holder from having a university education and being a new fan respectively. Standard errors are given in brackets and the asterisks indicate the significance of a variable: three at the 1% level, two at the 5% and one at the 10% level.
Table 7.3: Probit Model of the Probability of being a Season Ticket Holder

<table>
<thead>
<tr>
<th></th>
<th>Constant</th>
<th>Income34</th>
<th>Income56</th>
<th>MissEmp</th>
<th>MissOth</th>
<th>A3140</th>
<th>A4150</th>
<th>A51Plus</th>
<th>Univ</th>
<th>Vdistmil</th>
<th>Newfan</th>
<th>LR test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenal</td>
<td>-0.006</td>
<td>0.036</td>
<td>0.128*</td>
<td>0.068</td>
<td>0.147*</td>
<td>0.157***</td>
<td>0.211***</td>
<td>0.363***</td>
<td>0.027</td>
<td>-0.003***</td>
<td>-0.245**</td>
<td>103.799***</td>
</tr>
<tr>
<td></td>
<td>(0.076)</td>
<td>(0.074)</td>
<td>(0.075)</td>
<td>(0.139)</td>
<td>(0.085)</td>
<td>(0.057)</td>
<td>(0.069)</td>
<td>(0.063)</td>
<td>(0.046)</td>
<td>(0.0006)</td>
<td>(0.107)</td>
<td></td>
</tr>
<tr>
<td>Newcastle U.</td>
<td>0.224***</td>
<td>-0.014</td>
<td>-0.140***</td>
<td>-0.218***</td>
<td>-0.170***</td>
<td>0.102***</td>
<td>0.031</td>
<td>0.191***</td>
<td>0.110***</td>
<td>-0.001***</td>
<td>-0.259***</td>
<td>70.653***</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.041)</td>
<td>(0.047)</td>
<td>(0.082)</td>
<td>(0.045)</td>
<td>(0.039)</td>
<td>(0.045)</td>
<td>(0.044)</td>
<td>(0.032)</td>
<td>(0.0003)</td>
<td>(0.101)</td>
<td></td>
</tr>
<tr>
<td>Sheffield W.</td>
<td>0.314***</td>
<td>-0.034</td>
<td>-0.120**</td>
<td>0.106</td>
<td>0.049</td>
<td>0.029</td>
<td>0.174***</td>
<td>0.146***</td>
<td>-0.074**</td>
<td>-0.004**</td>
<td>-0.033</td>
<td>157.832***</td>
</tr>
<tr>
<td></td>
<td>(0.040)</td>
<td>(0.053)</td>
<td>(0.060)</td>
<td>(0.128)</td>
<td>(0.056)</td>
<td>(0.053)</td>
<td>(0.055)</td>
<td>(0.059)</td>
<td>(0.038)</td>
<td>(0.0005)</td>
<td>(0.055)</td>
<td></td>
</tr>
<tr>
<td>Southampton</td>
<td>0.096**</td>
<td>0.142***</td>
<td>0.126***</td>
<td>0.090</td>
<td>0.080</td>
<td>0.092*</td>
<td>0.089*</td>
<td>0.216***</td>
<td>-0.056</td>
<td>-0.001**</td>
<td>-0.218***</td>
<td>90.829***</td>
</tr>
<tr>
<td></td>
<td>(0.049)</td>
<td>(0.056)</td>
<td>(0.057)</td>
<td>(0.069)</td>
<td>(0.069)</td>
<td>(0.051)</td>
<td>(0.042)</td>
<td>(0.035)</td>
<td>(0.0006)</td>
<td>(0.050)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Ham</td>
<td>0.105</td>
<td>-0.028</td>
<td>-0.069</td>
<td>0.521**</td>
<td>0.437***</td>
<td>0.333</td>
<td>0.276***</td>
<td>0.192**</td>
<td>0.021</td>
<td>-0.005**</td>
<td>-0.212***</td>
<td>112.470***</td>
</tr>
<tr>
<td></td>
<td>(0.067)</td>
<td>(0.069)</td>
<td>(0.070)</td>
<td>(0.268)</td>
<td>(0.101)</td>
<td>(0.056)</td>
<td>(0.084)</td>
<td>(0.087)</td>
<td>(0.056)</td>
<td>(0.0009)</td>
<td>(0.086)</td>
<td></td>
</tr>
</tbody>
</table>

Frequency of Attendance among Non Season Ticket Holders

<table>
<thead>
<tr>
<th></th>
<th>Constant</th>
<th>Income34</th>
<th>Income56</th>
<th>MissEmp</th>
<th>MissOth</th>
<th>A3140</th>
<th>A4150</th>
<th>A51Plus</th>
<th>Univ</th>
<th>Vdistmil</th>
<th>Lamda</th>
<th>F test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenal</td>
<td>10.474***</td>
<td>2.170</td>
<td>1.996</td>
<td>0.426</td>
<td>-0.720</td>
<td>-2.195</td>
<td>-2.619</td>
<td>-3.488</td>
<td>-1.466</td>
<td>-0.001</td>
<td>-2.322</td>
<td>1.17</td>
</tr>
<tr>
<td>R²=0.071</td>
<td>(3.191)</td>
<td>(1.414)</td>
<td>(1.846)</td>
<td>(2.887)</td>
<td>(1.914)</td>
<td>(1.750)</td>
<td>(2.340)</td>
<td>(3.497)</td>
<td>(1.054)</td>
<td>(0.023)</td>
<td>(3.882)</td>
<td></td>
</tr>
<tr>
<td>Newcastle U.</td>
<td>7.353</td>
<td>-2.174</td>
<td>1.877</td>
<td>7.899**</td>
<td>-0.761</td>
<td>3.089*</td>
<td>3.206**</td>
<td>3.265</td>
<td>-4.894***</td>
<td>-0.011</td>
<td>-0.934</td>
<td>6.08***</td>
</tr>
<tr>
<td>R²=0.303</td>
<td>(4.946)</td>
<td>(1.485)</td>
<td>(2.101)</td>
<td>(3.318)</td>
<td>(2.208)</td>
<td>(1.906)</td>
<td>(1.571)</td>
<td>(2.456)</td>
<td>(1.549)</td>
<td>(0.014)</td>
<td>(3.471)</td>
<td></td>
</tr>
<tr>
<td>Sheffield W.</td>
<td>7.591</td>
<td>-0.916</td>
<td>-1.063</td>
<td>-3.742</td>
<td>-5.121***</td>
<td>-1.242</td>
<td>-1.839</td>
<td>-3.043</td>
<td>-0.228</td>
<td>-0.004</td>
<td>-4.811</td>
<td>5.21***</td>
</tr>
<tr>
<td>R²=0.276</td>
<td>(8.641)</td>
<td>(1.663)</td>
<td>(2.504)</td>
<td>(4.468)</td>
<td>(1.634)</td>
<td>(1.598)</td>
<td>(2.900)</td>
<td>(2.892)</td>
<td>(1.403)</td>
<td>(0.046)</td>
<td>(5.594)</td>
<td></td>
</tr>
<tr>
<td>Southampton</td>
<td>16.053***</td>
<td>-4.108**</td>
<td>-2.910*</td>
<td>-2.657</td>
<td>-3.935***</td>
<td>-2.662*</td>
<td>-1.896</td>
<td>-0.217</td>
<td>-1.601*</td>
<td>-0.022*</td>
<td>-1.779</td>
<td>2.57***</td>
</tr>
<tr>
<td>R²=0.112</td>
<td>(2.172)</td>
<td>(1.669)</td>
<td>(1.643)</td>
<td>(1.690)</td>
<td>(1.287)</td>
<td>(1.500)</td>
<td>(1.453)</td>
<td>(1.750)</td>
<td>(0.903)</td>
<td>(0.014)</td>
<td>(2.190)</td>
<td></td>
</tr>
<tr>
<td>West Ham</td>
<td>4.039*</td>
<td>0.041</td>
<td>1.904**</td>
<td>-0.532</td>
<td>-1.256</td>
<td>-0.982</td>
<td>-2.210</td>
<td>-0.698</td>
<td>1.276*</td>
<td>-0.008</td>
<td>-3.931</td>
<td>2.01**</td>
</tr>
<tr>
<td>R²=0.083</td>
<td>(2.386)</td>
<td>(0.911)</td>
<td>(0.935)</td>
<td>(5.159)</td>
<td>(2.840)</td>
<td>(0.807)</td>
<td>(1.798)</td>
<td>(1.689)</td>
<td>(0.757)</td>
<td>(0.017)</td>
<td>(2.774)</td>
<td></td>
</tr>
</tbody>
</table>
The interpretation of the coefficients in the second regression is the same as in the first regression, except that rather than referring to the probability of being a season ticket holder (conditional on being a fan) they show the frequency of attendance among non-season ticket holders. For example, the average Arsenal non-season ticket holder aged less than thirty years and earning below £15,000 per annum, attended 10.5 games per season. Increasing the fan's income to over £25,000 per year ($Income_{56}$) but holding other factors constant, increases attendance by 2 games per season, but the difference is not significant at conventional levels.

The important point about the table, as far as we are concerned, is that neither the conditional probability of being a season ticket holder nor the frequency of attendance among non-season ticket holders, is related to income, holding other factors constant. Thus in the case of the probit model, the income dummy variables $Income_{34}$ and $Income_{56}$ are generally insignificant and have conflicting signs. In the second regression, $Income_{34}$, $Income_{56}$, $MissEmp$ and $MissOth$ are significant in only six cases out of twenty income-club combinations. It therefore appears that soccer has a zero income elasticity with regards to the frequency of attendance among fans.

To appreciate the meaning of this finding it needs to be viewed in conjunction with the previous graphs. The graphs show that the income elasticity of demand for soccer is positive with regards to the decision to become an active fan. The results in table 7.3 show that the income elasticity of demand for soccer is
zero with regards to the frequency of attendance among fans. Neither the probability of being a season ticket holder, conditional on participation, nor the frequency of attendance among non-season ticket holders depend upon a fan's income, holding other factors constant. Thus combining the positive income elasticity for the first consumption decision with the zero income elasticity for the second consumption decision, we can therefore conclude that soccer is a normal good, with an overall positive income elasticity of demand. The results in chapter five also suggest that soccer is a normal good. However this has now been confirmed using a combination of the zonal model and the individual travel cost model. The finding in this chapter is more compelling than in chapter five due to the addition of individual observations.

There are a few other points of interest to note about the results in table 7.3. The decision to become a season ticket holder, conditional on being a fan, is seemingly a rational process. The decision is not influenced by a fan's income and education, but is consistently affected by a fan's age, whether they are a new fan and also by travel distance. The probability of being a season ticket holder seems to increase with age. Thus the $A3140$ dummy variable is significant in the probit model for two clubs at the 1% level, $A4150$ is significant for three clubs at the 1% level, while $A51plus$ is significant in four cases at the 1% level, all with a positive sign. This may be because older fans are more organised than younger fans. Applying for a season ticket holder requires some degree of preplanning: an application form must be filled in. It may also be that older fans are more likely to have all or most of their weekends free to attend soccer matches than younger fans.
In addition, older fans may have preferential access to credit when buying a season ticket.\textsuperscript{47} \textsuperscript{48} Being a new fan significantly reduces the probability of being a season ticket holder, other factors remaining constant, for the reasons already considered.

Travel distance is a strong deterrent to owning a season ticket. This is presumably because fans wish to buy a season ticket only if they can be assured of attending the majority of the games, but this is likely to be more feasible the nearer that a fan lives to the club. Those living near to a stadium will spend less on travelling to a game and will therefore plan to attend more often. Thus it becomes "worth" buying a season ticket.

In contrast with the probability of being a season ticket holder, the frequency of attendance among non-season ticket holders tends mainly to be random noise. Each of the variables in the second regression tends to be insignificant across the five clubs and, where it is significant, the signs of the coefficients conflict. For example, the age dummy variables are significant in only two cases out of fifteen age-club combinations (three age dummy variables for five clubs) and the distance variable always has a negative coefficient but is significant only at one club.

\textsuperscript{47} There is a counter argument to suggest that the probability of being a season ticket holder could be lower among older fans, as younger fans are likely to have fewer competing family commitments. However, this is not supported by the results.

\textsuperscript{48} There may be an interaction between the $AS1plus$ dummy variable and the $MissOth$ variable. The majority of people who do not answer the income question are retired. However the interaction does not alter the finding that the probability of being a season ticket holder increases with age. To estimate the change in attendance from being retired, we could add the $MissOth$ coefficient to the $AS1plus$ coefficient. The $MissOth$ variable is significant at three clubs, with a positive coefficient at Arsenal and West Ham and with a negative coefficient at Newcastle. However, in the case of Newcastle, the net effect is still positive, adding the $MissOth$ and $AS1plus$ coefficients together.
Finally, there is no evidence for sample selection bias. The Inverse Mills Ratio $\lambda$ variable is negative across all of the clubs but never significant; given that the $\textit{newfan}$ variable meets the criterion for an appropriate instrument, this suggests that there is no sample selection bias. In spite of this, it is still correct to have estimated the two equations within a Heckman selection model. The question of whether we should have used the Heckman selection model is similar to the question of whether one should include a variable in a model, which we expect to be significant, but tests then prove otherwise. In such cases, it may still be better to include the variable, even though the variable is not significantly different from zero. Its coefficient is still the best available point estimate and omitting it would alter the coefficients estimated on the remaining variables.
References


Heckman, J. J. (1976), "The common structure of statistical models of truncation, sample selection, and limited dependent variables and a simple estimator for such models", *Annals of Economic and Social Measurement*, volume 5, 475-493.


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Chapter 8: Conclusions

Using the travel cost model we have obtained perhaps the first unbiased estimates of the ticket price elasticity of the demand for live soccer and obtained a more convincing answer than previous studies to whether soccer attendance is a normal good. In chapter two we argued that previous estimates of the ticket price elasticity are biased downwards by the omission of travel costs. The previous estimates of the ticket price and income elasticity are also likely to be biased due to generic problems with the time series approach and methodological problems with particular pooled studies. However the travel cost model, which is applied to soccer events in chapter three, defines the price variable as the admission price plus the direct costs and time costs of a return journey. The model also uses cross sectional data rather than the usual time series or pooled data. As a result the estimates from the travel cost model are more firmly based than previous estimates.

The estimates of the ticket price elasticity from the travel cost model are presented in chapters five and six, while the income elasticity is examined in chapter seven from a travel cost perspective. The estimates of the ticket price elasticity from the travel cost model are more consistent with profit maximisation than the previous estimates. Profit maximisation implies that clubs should set their ticket prices at the point where the ticket price elasticity is either minus one or less than minus one (elastic). However, previous studies have consistently found demand to be highly price inelastic, with a ticket price elasticity nearer to zero than
minus one. In contrast the median ticket price elasticity from the travel cost model is \(-0.74\) (under the core assumptions), which can be reconciled with profit maximisation given current levels of complementary sales.

Thus, from the travel cost model, we can conclude that clubs have more regard to profits or revenue when setting their ticket price than was previously thought to be the case. The results from the travel cost model have also helped to resolve the debate on the income elasticity. It is unclear from previous studies whether soccer is a normal good or an inferior good. The travel cost model shows that soccer is indeed a normal good; increasing a person's income increases the likelihood of his or her becoming an active fan, holding other factors constant.

The absence of travel costs from the previous studies not only biased previous estimates of the ticket price elasticity, hence the puzzling values, but it also meant that the studies could not shed light on the role of travel costs and its effect on attendance. However the travel cost model shows the role of travel costs in considerable detail.

The analysis shows that increasing travel costs has two effects. First, increasing travel costs reduces participation particularly among low-income groups. High travel costs may be the root cause of social exclusion in English soccer. In addition high travel costs are a deterrent to attendance among current fans through the decision to buy or not buy a season ticket. The net effect is that increasing travel costs reduces a club's per capita ticket sales.
This thesis introduces the travel cost approach to the demand for live soccer. The insights are considerable. The model yields more credible estimates of the ticket price elasticity; helps to resolve the debate on the income elasticity; and highlights the importance of travel costs to fans. However, the model has yet more potential.

Inelastic ticket price is a recurrent finding in American sports as well as Australian Rules Football. These sports may also benefit from a travel cost approach. In its current format the model divides the catchment area of a club into concentric zones. However, with a detailed knowledge of the road network it may be possible to define more precise areas of equal travel cost (so called isochrones) rather than concentric rings. It may also be possible to use the model to give an actual number for the income elasticity rather than showing that the income elasticity is positive. For example, given data on the proportion of the population that are male, and the proportion that have a degree qualification, one could predict the mean wage of a zone (employing a complementary data set). Substituting the predicted wage into the travel cost model would then give a number for the income elasticity.

These refinements were not introduced here in the first instance, since the software for defining detailed isochrones is prohibitively expensive, and in the second instance since our aim was to show whether soccer is a normal or an inferior good. For this, it is sufficient to show that live soccer has a positive income elasticity of demand.
Future studies may wish to introduce these refinements and to apply the model to other sporting contexts. At the very least, future studies should strive to include travel costs as part of the price variable. If this is not possible due to a lack of data, then they should highlight the potential downward bias in regard to the ticket price elasticity.
APPENDIX ONE:

1995/96 F.A. PREMIER LEAGUE NATIONAL FAN SURVEY QUESTIONNAIRE
QUESTIONS 1a-14a

FA Premier League
National Supporter Survey 1996

Please answer all the questions if you can. You usually just have to tick a box. If you cannot
answer all the questions or you don't want to provide your name, address and postcode your
replies are still useful to us. When you have completed the questionnaire, sign and pop it in the
post. No postage is required. Thanks for your help.

A. Patterns of attendance

1(a) How many of your club's matches do you usually attend in a season? (Tick one box only)
At Home 1-2 ☐ 3-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ All ☐
Away None ☐ 1-2 ☐ 3-5 ☐ 6-10 ☐ 11-15 ☐ 16 or more ☐

2(a) Were you born in the town/city or in the area (say within 20 miles) where your own club plays?
Yes ☐ No ☐

3(a) Are you a fan of this club? Have you started attending matches regularly only over the
past few years or recently returned to the game?
Yes, a new fan ☐ Yes, a returned fan ☐ No, a fan for some time ☐

4(a) Are you a season ticket holder with us?
Yes ☐ No ☐

5 Have you attended any non-Premiership football 'live' this season? (Tick as many boxes as you need)
Yes, Endsleigh League One ☐ Yes, top non-League (eg. Conference) ☐ No ☐
Yes, Endsleigh League Two/Three ☐ Yes, Women's National League football ☐

6(a) Do you have a favourite continental club? (If none, say so) ....................................................

(b) If you are a season ticket holder, how much did your ticket cost for the season?
Season ticket cost £ .......................................................................................
Match ticket cost £ .......................................................................................

7 Have you attended any non-Premiership football 'live' this season? (Tick as many boxes as you need)
Yes, Endsleigh League One ☐ Yes, top non-League (eg. Conference) ☐
Yes, Endsleigh League Two/Three ☐ Yes, Women's National League football ☐

8(a) About how old were you when you first started to attend 'live' matches of this club?
Under 10 years ☐ 10-14 ☐ In my 15s ☐ 16-19 ☐ 20 years or older ☐

(b) How many of your club's matches do you usually attend in a season? (Tick one box only)
At Home 1-2 ☐ 3-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ All ☐
Away None ☐ 1-2 ☐ 3-5 ☐ 6-10 ☐ 11-15 ☐ 16 or more ☐

9(a) What do you think about the way we present home matches these days (eg. music, mascots, on
pitch entertainment, etc):
I really like it ☐ It's OK ☐ I'm not keen ☐ I hate it ☐ Don't know ☐

(b) If you travel by car to home games, how many other people normally travel in the car with you?
Away None ☐ 1-2 ☐ 3-5 ☐ 6-10 ☐ 11-15 ☐ 16 or more ☐

10(a) About how far from our home ground do you now live? (Give an estimate)
I live about ........................................ miles from my club's ground.

11 Why did you begin supporting this particular club? (Tick any options which were important)
My local club ☐ Friend(s) liked them ☐ My child got interested ☐
The club's image ☐ Through a business contact ☐
Other reasons(s) .................................................................

12(a) How important would you say this club is in your life now?
One of the most important things in my life CD Very important CD Just one of the things I do CD

(b) How important to you are today, compared to five years ago?
More important CD Less important CD About the same CD

13(a) What do you think about the way we present home matches these days (eg. music, mascots, on
pitch entertainment, etc. If you came alone, say so).
As lively as it ever was CD Quieter than I'd like CD

(b) If you want to tell us more about what you like or dislike about how we present matches do so here

14(a) Do you take your school age kid(s) to home matches? (Tick one box only)
Yes, always ☐ Yes, sometimes ☐ No ☐ I have no school age kids ☐

B. Travelling to the Match

15(a) About how far from our home ground do you now live? (Give an estimate)
I live about ........................................ miles from my club's ground.

(b) How do you usually travel to our home matches? (Tick all the boxes you need)
I walk all the way CD In my own car CD By tube/metro CD
I cycle all the way CD On supporters coach CD By tube/metro CD
By local bus CD Get a lift in a car/minibus CD

16(a) Do you take your school age kid(s) to home matches? (Tick one box only)
Yes, always CD Yes, sometimes CD No CD I have no school age kids CD

C. Why Do You Support this Club?

16(a) About how old were you when you first started to attend 'live' matches of this club?
Under 10 years ☐ 10-14 ☐ In my 15s ☐ 16-19 ☐ 20 years or older ☐

(b) Who did you attend your first football match with (father, mother, god/diy friend, other friends
etc. If you came alone, say so).
My local club CD Friend(s) liked them CD Family influences CD
The way we played CD Saw them on TV CD First club I saw 'live'
Certain player/players CD Through a business contact CD My child got interested
The club's image CD Used the lift CD I moved to the area CD
Other reasons(s) .................................................................

D. Matchday Experiences

17(a) What do you think about the way we present home matches these days (eg. music, mascots, on
pitch entertainment, etc)
During the pre match build-up?
I really like it CD It's OK CD I'm not keen CD I hate it CD Don't know CD
At half time?
I really like it CD It's OK CD I'm not keen CD I hate it CD Don't know CD

(b) If you want to tell us more about what you like or dislike about how we present matches do so here

18(a) What do you think about the atmosphere inside our home ground these days compared to
the last few years? (Tick one box only)
As lively as it ever was CD Quieter than I'd like CD
Not as lively, but okay CD Deadly dull CD

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1995/96 F.A. PREMIER LEAGUE NATIONAL FAN SURVEY QUESTIONNAIRE

14(b) Would you be in favour of, say, an area of non-reserved seating at this ground, especially for fans who want to sing and chant?

Yes ☐ No ☐ Don't know ☐

14(c) If you would like changes in the atmosphere at football these days, what else could we do to improve things for you?

E. Safety and Fan Behaviour

15(a) How would you describe general levels of comfort at home games? (leg room, seats etc)

(Tick on box only)

Excellent ☐ Good ☐ Fair ☐ Not good ☐ Poor ☐

Don't know ☐

If yes, at which ground(s) and why did you feel unsafe?

15(b) Have you felt unsafe inside or outside any Premier League stadium this season (eg: poor exits, lack of seating space, crushng, bad crowd management, etc)?

Yes ☐ No ☐

If yes, at which ground(s) and why did you feel unsafe?

F. Policing and Stewarding

20(a) Are you generally satisfied with standards of football policing this season:

At home matches?

Yes ☐ No ☐ Don't know ☐

At away matches?

Yes ☐ No ☐ Don't know ☐

20(b) Are you generally satisfied with stewarding:

At home matches?

Yes ☐ No ☐ Don't know ☐

At away matches?

Yes ☐ No ☐ Don't know ☐

G. Your Own Club

22(a) Thinking about our administration (ticket office, responding to enquiries, etc), how does it compare to, say, five years ago?

Better than five years ago ☐ The same as five years ago ☐

Worse than five years ago ☐ Don't know ☐

22(b) On the playing side, how do you think our chances of reasonable playing success compare now, to say, five years ago?

Better than five years ago ☐ The same as five years ago ☐

Worse than five years ago ☐ Don't know ☐

23(a) On the 'business' side (marketing, executive facilities, promotions, merchandising) what do you think of our approach?

Too much emphasis on 'business' activities ☐ About right ☐

Need to be more aware of 'business' opportunities ☐ Don't know ☐

23(b) On the 'community' side (work in local schools and neighbourhoods; contacts with supporters, etc), what do you think of what we do?

Too much emphasis on 'community' activities ☐ About right ☐

Need to be more aware of 'community' opportunities ☐ Don't know ☐

H. Premiership Football and Europe

24(a) Most British clubs fared poorly in European club competitions in 1995/96. suggesting the quality of top football here is really quite low at the moment. Do you agree with this conclusion?

Yes ☐ No ☐ Don't know ☐

24(b) Is there anything the game here should be doing to improve the general quality of play in this country? If so, say what here.

25(a) A recent European Court ruling following the Bosnian case now means that Premiership clubs can field as many foreign players from European Union countries as they like. Are you in favour of this change?

Yes ☐ No ☐ Don't know ☐

25(b) In the light of the Bosman ruling, would you be in favour of Premiership clubs being required to field a minimum number of British players?

Yes ☐ No ☐ Don't know ☐
26(a) UEFA is considering increasing the size of European club competitions so that, instead of 6 or 7 clubs, as many as 10 or 12 English clubs could be involved in Europe soon. Would you be in favour of this change?

Yes ☐ No ☐ Don’t know ☐

(b) It is possible that, as well as the Premiership winners, the English club with the best recent league record (over 5 or 10 years) will soon be invited to play in the European Cup. Would you be in favour of this change?

Yes ☐ No ☐ Don’t know ☐

27(a) If European club competitions expand, we may need to consider a winter break in our season in order to come into line with countries abroad and give our clubs a better chance in Europe. Would you be in favour of this?

In favour, if it helps our clubs ☐ Against ☐

In favour, but only if we keep Christmas and New Year matches ☐ Don’t know ☐

(b) A European League has recently been suggested, which would involve a number of top clubs from England, and which would be run alongside the Premiership schedule. Are you in favour of this idea?

Yes ☐ No ☐ Don’t know ☐

I. Miscellaneous Issues

28(a) Should we experiment with video aids for referees for crucial decisions during matches, as umpires have in cricket?

Yes ☐ No ☐ Don’t know ☐

(b) What do you think about the number of yellow and red cards now being shown by referees to top players in England?

Too many ☐ About right ☐ Too few ☐

(c) Is the increased use of red and yellow cards helping to protect ‘flair’ players in England today, so improving the game?

Yes ☐ No ☐ Don’t know ☐

29(a) Are you, or your household, a subscriber to the Sky Sports Channel?

Yes ☐ No ☐

(b) What do you think about TV coverage of top football compared to, say, five years ago?

Better than five years ago ☐ Worse than five years ago ☐ No difference ☐

(c) If you could subscribe to a channel which showed all your club’s away matches ‘live’, would you be interested in doing that?

Yes ☐ No ☐ Don’t know ☐

(d) What kind of programmes about football would you like to see more of on network TV (ITV, BBC, etc)?

... (CONTINUED AT BOTTOM OF NEXT PAGE)
Appendix Two: Formula for the ticket price elasticity

The number of tickets sold per 100 people in the $i^{th}$ zone during the 1995/96 season is given by the equation:

$$TICKETS_i = e^{\alpha_0 + \alpha_1 \times GENCOST_i + \alpha_2 \times AFFINITY_i + \alpha_3 \times SCL12_i} = e^{\lambda_i}$$

The coefficient $\alpha_0$ is a constant and represents fixed effects. The coefficients $\alpha_1$, $\alpha_2$ and $\alpha_3$ are slope coefficients. These coefficients are determined using a pooled regression but allowing their values to vary by club. The parameter $GENCOST_i$ represents the generalised cost for the $i^{th}$ zone:

$$GENCOST_i = TP + TC_i$$

where $TP$ is the weighted mean ticket price and $TC_i$ is the travel cost for a return journey from the $i^{th}$ zone. The parameter $AFFINITY_i$ is a measure of club commitment for residents in the $i^{th}$ zone. It equals the proportion of the zonal population that attend three or more away games in the 1995/96 season. The parameter $SCL12_i$ is a proxy for the mean income in the $i^{th}$ zone. It equals the proportion of the zonal population that belong to social class one or two in the 1991 national Census. The techniques for calculating $GENCOST_i$, $AFFINITY_i$ and $SCL12_i$ are given in chapter four.
Taking Arsenal as an example, the fixed effect coefficient $\alpha_0$ equals 1.05 and the slope coefficients are $\alpha_1 = -0.0357$, $\alpha_2 = +2.48$, $\alpha_3 = +0.037$ (see table 5.1). This gives:

$$TICKETS_i = e^{1.05 - 0.0357 \times GENCOST_i + 2.48 \times AFFINITY_i + 0.037 \times SCL12_i} = e^{\lambda_i}$$

so $\lambda_i = 1.05 - 0.0357 \times GENCOST_i + 2.48 \times AFFINITY_i + 0.037 \times SCL12_i$

The weighted mean ticket price for Arsenal in 1995/96 was £16.644 (see table 4.4), giving:

$$GENCOST_i = TP + TC_i = £16.664 + TC_i$$

The total predicted zonal ticket sales, $\hat{N}_i$, is then given by:

$$\hat{N}_i = TICKETS_i \times \frac{\text{population of zone } i \times (POP_i)}{100} = K_i \times TICKETS_i$$

$$K_i = \frac{POP_i}{100}$$

To estimate the ticket price elasticity, we assume that travel cost effects perfectly duplicate admission price effects. For example, if the ticket price increases by £1 or travel cost increases by £1 in every zone, the effect on attendance is the same. In both cases the generalised cost increases by £1.
The point ticket price elasticity is given by:

$$\text{TP Elasticity} = -0.0357 \times (K_1 \cdot e^{\lambda_1} + K_2 \cdot e^{\lambda_2}) x \frac{\text{TP}}{K_1 \cdot e^{\lambda_1} + K_2 \cdot e^{\lambda_2}}$$

For illustrative purposes, consider a simple model consisting of only the first two zones around Highbury. Applying the formula for the ticket price elasticity and cancelling gives:

$$\text{TP Elasticity} = -0.0357 \times (K_1 \cdot e^{\lambda_1} + K_2 \cdot e^{\lambda_2}) x \frac{\text{TP}}{K_1 \cdot e^{\lambda_1} + K_2 \cdot e^{\lambda_2}} = -0.594$$

Arsenal’s ticket price elasticity is given by its GENCOST coefficient multiplied by its weighted mean ticket price. Arsenal’s consumer price elasticity can be
calculated in the same manner. The following result is for all twelve zones surrounding Highbury.

Consumer Price Elasticity

\[ = -0.0357 \times \text{(mean GENCOST}_i \text{ across all 12 zones, weighting each zone by } \hat{N}_i) \]

\[ = -1.080 \]
APPENDIX THREE:

1998/99 F.A. PREMIER LEAGUE NATIONAL FAN SURVEY QUESTIONNAIRE QUESTIONS 1a-9

Sheffield Wednesday

FA Premier League National Fan Survey 1999

A Patterns of attendance
1. How many of our matches do you usually attend in a season? (tick one box only on each row)
   - At Home
     - 1-5
     - 6-10
     - 11-15
     - 16-20
     - All
   - Away
     - None
     - 1-5
     - 6-10
     - 11-15
     - 16-20
     - All

2. Were you born in the town or city or in the area (say within 20 miles) where we play our home games? (tick one box only)
   - Yes
   - No

3. (b) How far away from our own ground do you live now?
   I live about __________ miles away from our ground.

4. Would you say you came from a family that has a tradition of supporting this club? (tick one box only)
   - Yes
   - No

5. Which of the following are you? (tick any boxes which apply to you)
   - Season ticket holder with us
   - One of our shareholders
   - Supporters’ club member
   - Executive club member
   - ISA or FSA member
   - None of these

6. For how many years have you been attending matches at this club? (tick one box only)
   - My first season
     - 1-2 years
     - 3-5
     - 6-10
     - 11-15
     - 16-20
     - Over 20 years
   - Below 10 years
     - 1-2 years
     - 3-5
     - 6-10
     - 11-15
     - 16-20
     - Over 20 years

7. Would you say you are a new fan? (started attending matches in the last five years?) Or maybe you have returned to football after some time away? (tick one box only)
   - Yes
   - No

8. If you have a child who supports another club, say which club and which of your children support? (tick one box only)

9. Who do you usually take to games with you? (tick one box only)
   - I don’t have school age kids
   - Yes, I bring kids sometimes

10. If you have a child aged 11-15, do you usually take your own school age kids to home matches? (tick one box only)
    - Yes, I usually bring kids
    - No, I have kids but don’t bring them

11. Do you think about the services we try to offer our supporters? Tell us what you think about what we currently offer by marking just one number on each row to describe what you feel about each issue. If you don’t know just ring 0 on that row.

C Matchdays and Club Services

9. What do you think about the services we try to offer our supporters? Tell us what you think about what we currently offer by marking just one number on each row to describe what you feel about each issue. If you don’t know just ring 0 on that row.

Rank our services

<table>
<thead>
<tr>
<th>Information from the club to fans</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Not good</th>
<th>Poor</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
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<td>2</td>
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<td>2</td>
<td>3</td>
<td>4</td>
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<td>4</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

| Cost of match tickets here       | 1        | 2    | 3    | 4        | 5    |
| Quality of food and drink in the ground | 1 | 2 | 3 | 4 | 5 |
| Quality of the match programme   | 1        | 2    | 3    | 4        | 5    |
| Our current first team match trip | 1        | 2    | 3    | 4        | 5    |
| Parking near the ground          | 1        | 2    | 3    | 4        | 5    |
| The general attitude of club staff to supporters | 1 | 2 | 3 | 4 | 5 |
| The standard of toilets in the ground | 1 | 2 | 3 | 4 | 5 |
| Standard of stewarding at home matches | 1 | 2 | 3 | 4 | 5 |
| Policing at home games           | 1        | 2    | 3    | 4        | 5    |
| Public transport to the ground   | 1        | 2    | 3    | 4        | 5    |
| General safety of the ground     | 1        | 2    | 3    | 4        | 5    |
| Ease of contacting the club by phone | 1 | 2 | 3 | 4 | 5 |
| Cost of refreshments at the club | 1        | 2    | 3    | 4        | 5    |
| Facilities and prices for junior fans | 1 | 2 | 3 | 4 | 5 |
| Value for money of attending home games | 1 | 2 | 3 | 4 | 5 |
| The quality and range of club merchandise | 1 | 2 | 3 | 4 | 5 |
| The links between our players and fans | 1 | 2 | 3 | 4 | 5 |
| General quality and standard of our facilities at our ground | 1 | 2 | 3 | 4 | 5 |
| Our activities on the ‘community’ side | 1 | 2 | 3 | 4 | 5 |
| The amount to which we listen to fans’ views | 1 | 2 | 3 | 4 | 5 |

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1998/99 F.A. PREMIER LEAGUE NATIONAL FAN SURVEY QUESTIONNAIRE
QUESTIONS 10-22b

If there is one thing which you think this club could do differently which would make attending home matches easier or more attractive for you say what here.

10 How do you usually travel to our home matches? (Tick one box only)
- I walk/cycle the whole way
- In a minibus
- By train
- In my own car
- By local bus
- On a supporters' coach
- I get a lift in a car
- By tube/metro

D Why do you Support Us?

11 What was the thing which attracted you to attend our games rather than those of another football club? Why are you supporting this club? Tick any options which apply to you. Tick as many as you like, or none.

Why did you come to support us?
- My family were supporters
- I became a fan to see us win things
- It's my local club
- It's a good club
- It's a friendly club
- My friends were fans
- This club plays good football
- I moved to the area
- I saw us on TV
- I can afford to come to games here
- I liked certain players
- I just prefer football at this level

12 How important would you say this club is in your life now? (Tick on*
- Very important
- Quite important
- Important
- Less important

O Situation
- Financial/Credit card services, etc
- Funds for Youth Academies at clubs
- Funds for stadium redevelopment outside the Premier League
- Funds for 'grass roots' (local football) development
- Funds for education/social Initiatives (club classrooms, anti-racist work etc)
- Extend the length of the English season (start earlier, finish later)
- Reduce the Premier League to 18 clubs
- Lose replays and two-legs and end Worthington Cup much earlier (Final in January)
- Start FA Cup earlier for top clubs (say, early December)

About how much do you and your family usually spend on official club merchandise in a normal season? Think hard about what you have bought this season, for example. If you normally spend nothing, please write that in the space. Make sure you write something here.

17 When you watch English football on TV what kinds of matches do you prefer to watch? (Tick one box only)
- Mainly Premier League
- Mainly Football League
- A mix

F Football Spending

18 What do you normally pay to attend home matches? If you have a season ticket say how much that cost* for the whole season. If you pay per match say how much that cost*. Only fill in one of these spaces. Cost for yourself only.

- Yes
- Yes, but only my club's matches
- No
- Don't know

My total estimated spend on attending our matches this season is £

G Domestic and European Football

19 About how much would you and your family usually spend on official club merchandise in a normal season? Think hard about what you have bought this season, for example. If you normally spend nothing, please write that in the space. Make sure you write something here.

20 Next season there will be much more club football in European competitions than there has been in the past. What do you think about this development? (Tick one box only)
- In favour
- Against
- Don't know/unsure

b) If we need to change our domestic football to accommodate more European play, which of the following options would you favour. (Tick any options you would support).

- Extend the length of the English season (start earlier, finish later)
- Reduce the Premier League to 18 clubs
- Lose replays and two-legs and end Worthington Cup much earlier (Final in January)
- Start FA Cup earlier for top clubs (say, early December)
- Lose replay from the FA Cup

1 My club reaching the FA Cup final
2 My club beating our local rivals in derby matches
3 My club finishing high up the Premiership

21 How important is club and international success for you as a fan? How important is European club success to you? What are your priorities? Let us know how you feel about each of these by ranking them from 1-6 in terms of their importance to you. Put just one number in each box. (1 = most important, 6 = least important)

- England having a successful World Cup
- My club having a good run in Europe
- My club reaching the FA Cup final
- My club beating our local rivals in derby matches
- My club reaching the Worthington Cup final
- My club finishing high up the Premiership

22 How important is a successful England team for the health of the game in the country? (Tick one box only)

- Very important
- Quite important
- Neutral
- Not important
- Very unimportant

b) What do you think of FA's idea of holding the World Cup finals every two years rather than every four years? (Tick one box only)

- In favour
- Against
- Don't know
1998/99 F.A. PREMIER LEAGUE NATIONAL FAN SURVEY QUESTIONNAIRE
QUESTIONS 23a-32

23. What do you think about the overall quality of football in the FA Premier League this season? (Tick one box only)
   □ Better than any league in Europe  □ Not as good as some leagues
   □ As good as any league in Europe  □ Not very good at all

(b) Would you like to see more top football in this country played in a slower, more measured, style like that more typical on the continent? (Tick one box only)
   □ Yes  □ No  □ Don't know

General Questions
24. What do you think about the general condition (administration, finance, ground etc.) of this club compared to, say, five years ago? (Tick one box only)
   □ Better than five years ago  □ About the same
   □ Worse than five years ago  □ Don't know

(b) How do you feel about the likely future of this club, say over the next five years? (Tick one box only)
   □ I'm very optimistic about our future  □ I'm not optimistic
   □ I'm quite optimistic  □ I'm very pessimistic

(c) How do you rate this club's chances of winning a top competition now compared to, say, five years ago? (Tick one box only)
   □ More chance of winning now  □ Less chance now  □ No change
   □ Don't know

25. Is it important to you at all that this club fields some local players in its teams these days? (Tick one box only)
   □ Yes, it is vitally important to have local players
   □ It is good to have local players, but it's not that important
   □ No, this club should get the best players from wherever it can
   □ Don't know

(b) Are you concerned about the number of foreign players coming into the English game at the moment? (Tick one box only)
   □ Yes, foreign players improve standards
   □ No, foreign players are now limiting opportunities for British players
   □ I think we are getting close to the limit for foreign players
   □ Don't know

26. How do you feel about the way the club is organised at the moment, in terms of the ownership and decision making side of the club? (Tick one box only)
   □ It works well  □ It works reasonably
   □ It works badly  □ Don't know

(b) What do you think about the general effects for top football of club flotations and more Stock Market involvement in the sport? (Tick one box only)
   □ A good thing for football  □ A bad thing for football  □ No effect  □ Don't know

27. Have you, yourself, seen or heard any of the following at our matches this season? (Tick any boxes which apply)
   □ Fighting andinking fans  □ Language which is offensive to you
   □ Missile throwing  □ Racism aimed at spectators
   □ Racist comments against players  □ None of these

(b) Do you think helicopterism is a problem at our matches? (Tick one box only)
   □ Yes, a serious problem  □ A problem, but not serious  □ No real problem

(c) If there are any particular club fans who cause problems at matches you attend say which clubs here.

Personal Details (This is confidential: we will use it only to analyse our data)
28. How old are you? (Tick one box)

(b) Are you:
   □ Male  □ Female

29. Are you:
   □ Married or living with a partner  □ Single  □ Divorced/Widowed

(b) Do you have any school age children (16 years or below)? (Tick one box only)
   □ Yes  □ No

30. What is your current employment status? (Tick one box only)
   □ Full-time employed  □ Part-time employed  □ Full-time student  □ Unemployed
   □ Retired  □ Homemaker

(b) If you are in full time work what is your current job? (Give a little detail)

(c) Did you, or do you now, go to a University or Polytechnic? (Tick one box only)
   □ Yes  □ No

31. If you are in full time work, how much do you earn? (Tick one box only)
   □ £10,000 or below  □ £10,001-15,000  □ £15,001-20,000  □ £20,001-25,000
   □ £25,001-30,000  □ £30,001-35,000  □ £35,001-40,000  □ Over £40,000

(c) To which of the following 'ethnic' groups would you describe yourself as belonging? (Tick one box only)
   □ White British  □ Black British  □ Other (e.g. foreign national)
   □ Don't know

32. How do you feel about the likely future of this country, say over the next five years? (Tick one box only)
   □ I'm very optimistic  □ I'm not optimistic
   □ I'm quite optimistic  □ I'm very pessimistic

(c) How do you feel about the likely future of this club, say over the next five years? (Tick one box only)
   □ Better than five years ago  □ Not as good as five years ago
   □ Same as five years ago  □ Worse than five years ago

Fourth fold here and then tuck in

THANKS FOR YOUR HELP
If you want your name to go forward into the prize draw or if you would like your name to be added to our computerised list so we can include you in future surveys, please leave your details here. Your details will NOT be sent to any commercial organisation of any kind. They will be used only for research or by your club.

If you don't leave your details please leave your POSTCODE which we can use in our analysis.

Name .................................................
Address .............................................
Postcode ............................................

NOW RETURN THIS QUESTIONNAIRE BY FOLDING AS INDICATED WITH YOUR ADDRESS INSIDE THE FOLD. NO STAMP IS REQUIRED.
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