AUSSIE RULES: SCHEDULING AS A DETERMINANT FOR ATTENDANCE DEMAND IN THE AUSTRALIAN FOOTBALL LEAGUE

by

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This thesis was prepared under the direction of the candidate's thesis advisor Dr. Keith Jakee, and has been approved by the members of her supervisory committee. It was submitted to the faculty of The Harriet L. Wilkes Honors College and was accepted in partial fulfillment of the requirements for the degree of Bachelor of Arts in Liberal Arts and Sciences.

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ABSTRACT

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The determinants of attendance at Australian Football League (AFL) games have become increasingly important due to a rise in international recognition of the sport and recent structural changes in the AFL. Scheduling has received little attention in the sports economics literature as a determinant of demand. This paper estimates the effect of day-of-the-week scheduling on attendance demand using OLS regressions on panel data gathered from the 1985 to 2008 AFL seasons. One implication of this study is that attendance, and thereby revenue, could be increased by scheduling certain fixtures on specific days and times.

To my fellow honors econ friends...

And me.

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I. Introduction

Consumer demand is a hot topic among researchers as it relates to both consumer and firm organization theory. Firms need to know the nature and determinants of demand in order to make profitable decisions; and researchers like to gain insight into the firm's behavior in response to these perceived determinants. In sports economics literature, the discussions on demand center on the determinants of gate attendance. The determinants that receive the most attention are uncertainty of outcome, price elasticity, and more recently, television broadcasting. The relative small amount of attention paid to scheduling is quite odd due to the decision-making nature of scheduling itself, and its direct implications for an ongoing economic discussion on sports league objectives. Scheduling is one of the most important and complicated decisions a sports league makes. An emphasis on the relationship between scheduling, attendance demand, and league objectives can shed more light on the internal behavior of sports leagues.

The AFL faces a tradeoff as do many leagues, between maximizing attendance and encouraging a long-run competitive balance. Complete competitive balance is not achieved solely by maximizing outcome uncertainty through placing clubs with similar performance levels in the same fixture. Competitive balance is also achieved with financial equality throughout the league, so that no club has a substantial financial advantage over another. One way to achieve financial equality is to use scheduling in a manner that equalizes attendance over each club per season. A profit-maximizing league, on the other hand, would use scheduling in order to maximize *league* attendance and therefore schedule clubs that attract large numbers on days that are the most popular.

The role of scheduling in the attendance demand literature so far has mostly been as a single control dummy testing for a non-weekend, typically found to be insignificant with little further discussion. I argue that scheduling, specifically, should deserve at least as much attention as uncertainty of outcome, or other determinants. The precise effect of scheduling on attendance has applications beyond adding it to the list of known determinants to demand. As a determinant of demand, the model, in effect, examines the direct impact of a complicated and critical firm decision on consumer demand. Whether the league's objective is profit-maximizing, competitive balance, or win-maximization, scheduling has important implications for league decisions and is worthy of more intensive study.

The Australian Football League (AFL) has several unique aspects that make it interesting for study. First, most sports attendance literature focuses on sports in the United Kingdom or U.S.A. and comparatively little research has been published about the AFL. Second, the AFL is ranked third in the world for attendances (behind only the NFL in the U.S. and Indian cricket, and ahead of major league baseball in the U.S.) making it a considerably popular sport world-wide and thus quite a large industry (Jakee and Kenneally 2009). Third, the industry has exhibited considerable growth and structure changes in the last 20 years as it moved from a traditionally Victoria-centered competition to a national one. The AFL has become a highly organized governing body regulating Australian football.

Using a traditional demand for attendance model, this paper will estimate the effects of day-of-the-week scheduling slots on gate attendance, controlling for variables such as pricing, lagged attendance (or habitual attendance), and performance. A simplified version of the model is as follows: $ATTEND_{mf} = \beta + \beta_1 x_1 + \beta_2\, x_2 + \cdots \theta x_i + \varepsilon,$ where the dependent variable $ATTEND$ is the gate attendance for a particular match, and fixture. A fixture is defined as the pairing of two clubs for a match, whereas a schedule refers to the day and time of match. The independent variables include price, distance, performance, venue capacity and scheduling variables.

This paper aims to achieve several goals. While it is certainly not revolutionary in terms of econometric technique, this paper does add to the literature utilizing a traditional linear demand model to determine the effect of scheduling – a heretofore ignored variable – on demand. Secondly, I wish to bring scheduling to the forefront of the demand discussion in terms of its relevance to firm theory – name sports league objectives. This paper has potential policy implications for the AFL depending on the priority objective. If attendance is found to vary not only amongst days and times, or slots, but amongst clubs and fixtures as well, and the goal of the AFL is to foster competitive balance, their goals would be better met by scheduling lesser-demanded clubs to more popular time slots in order to balance attendance amongst clubs. On the other hand, if the AFL's goal is to maximize profit, then placing greater-demanded clubs in the most popular time slots would maximize league attendance and therefore revenue.

The paper is organized as follows: first I begin with an overview of the treatment of scheduling in the literature. Next, I discuss the history and structure of the AFL. Third, I discuss the objectives of the AFL and how this relates to attendance demand. The next section describes my econometric model and estimation followed by a discussion of the results.

II. Scheduling in the Literature

Borland and Macdonald's (2003) review of literature on demand for attendance suggests several important items to be addressed in future research. First, the majority of sports demand papers focus on sports in the U.K. and U.S.A. such as soccer and baseball. For any conclusive evidence to be drawn from sports demand research, the span of focus needs to be broadened to encompass different types of sports. Secondly, very few studies actually include scheduling as a determinant for demand; those that do use a single dichotomous dummy variable to control for any effects scheduling might have on their main focus of study.

Schofield (1983) Garcia and Rodriguez (2002), and Allan and Roy (2008) are three studies that employed such a method. Schofield's multiple regression of attendance by a range of variables revealed that holidays attracted higher attendences. Garcia and Rodriguez (2002) were more interested in establishing an efficient estimation technique that correctly assessed all possible value of parameters, than any particular variable. By using a dummy for weekend or weekday, they found that attendance is significantly lower on a weekday versus a weekend. Alan and Roy (2008) also tested for a weekend or weekday significant but the results were inconclusive. Welki and Zlatoper (1994) use a Tobit estimation to test the various determinants of demand for the NFL in the 1991 season. Using two dummy variables to account for games not played on Sunday afternoon, and games played on Sunday night, they found attendance significantly higher on Sunday night and non-Sunday games. The most significant study of attendance by day-of-the-week scheduling was Butler's (2002) analysis of interleague play in Major League Baseball. He found, by means of defining one dummy variable per day, that attendance at games played on a Thursday relative to Monday, Tuesday, or Wednesday was significantly higher.

Borland and Lye (1992) and Forrest and Simmons (2006) measured scheduling frequency as a determinant of demand rather than strict scheduling slots. Forrest and Simmons (2006) studied the effects of congestion in scheduling in English football and found that televised, mid-week Champions League matches have a negative impact on gate attendance for lower division clubs. This is especially detrimental for lower division clubs as they do not generate as much revenue in broadcasting and merchandising as do the premier clubs. Similarly, Borland and Lye (1992) found that attendance is higher if matches are scheduled or spread out over a longer time period rather than clustered in one time frame. This gives fans a greater opportunity to attend matches for different clubs. Also, according to the findings of Forrest and Simmons (2006), spreading out the scheduling and broadcasting of games would not only increase attendance, but also television viewership.

Most of these authors do not discuss the theoretical implications of scheduling beyond advising sport management to adjust scheduling to further some goal. The most in depth discussion is that of Forrest and Simmons (2006) who discuss, somewhat at length, the revenue implications for different levels of clubs.

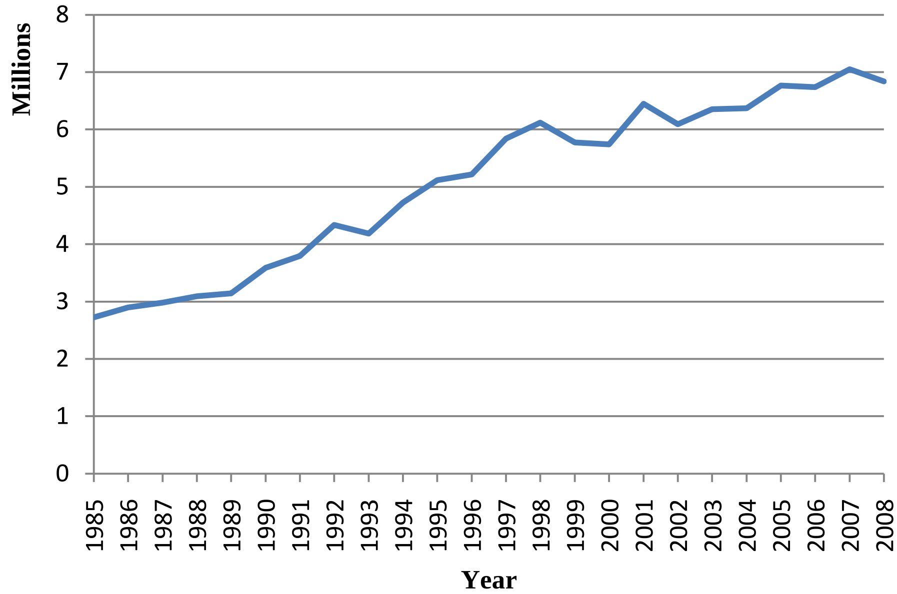
Perhaps the most robust treatment of scheduling, and indeed the inspiration for this paper, are the findings of Jakee et al. (2009) and Jakee and Kenneally (2009). Jakee et al. perform an analysis of the scheduling in the AFL over the seasons 1990 to 2003. Their analysis focuses upon scheduling matches at particular days and times, and ignores the concept of fixturing which is the pairing of clubs for a given match. Not only did they find that attendance significantly varies across time slots, but they also found that certain clubs are being given a disproportioned number of highly attended slots, and thus are able to earn a disproportionate amount of revenue. While they do not calculate directly competitive balance measurements, the disproportioned level of revenue seems at odds with a competitive balance objective by the League and instead points towards profit maximizing. Jakee and Kenneally (2009) follow up with a model that focuses on finding the determinants of scheduling in order to model the behavior and objectives of the league. In their model, scheduling slots were the dependent variable and attendance, revenues, and other variables were the determinants. The determinants of demand were not the focus of their paper. Instead, their goal was to find the factors that determine the allocation of scheduled time slots. Not only did they find that attendance and revenues were significant in scheduling, but they found that performance of the clubs was not significant. If performance is not a factor of scheduling, this implies that the league objective is decidedly not competitive balance. To capture the behavior of scheduling where the allocation of slots by team is the dependent variable and can be explained by previous levels of attendances and revenues and performances of clubs. Their model further shows that certain clubs are more likely to receive a disproportionate amount of the highly attended slots. A caveat that Jakee et al. acknowledge is that they start with the assumption that certain time slots are more heavily attended than others, ceteris paribus. In this paper, my model will control for variables to determine whether attendance does in fact vary across time slots as well as address the question of whether seasonal competitive balance is a determinant of demand.

III. History and Structure of the AFL

Australian Rules football originated and emerged as a sport in the State of Victoria in the 19th century. Football clubs and associations began to become more popular and widespread around the turn of the 20th century. Booth (2007) provides a extensive history of the economic development of the AFL. The first major governing association, the Victorian Football Association, formed in 1877. By 1897, eight of the strongest clubs broke off to form the Victorian Football League (VFL). By the 1950s, the VFL was the most prominent Australian football organization with twelve of the best clubs in the country (Booth 2007). During the 1980s, the VFL began to change its policies towards expansion, and allowed the West Australian League and Queensland League to join the VFL, increasing both the number of clubs, and its dominance into the national scene. By the 1990s, the VFL officially changed its name to the Australian Football League (AFL), making it the largest and strongest football league in the country.

Since the major structural changes of the 1980s and early 1990s, total attendance has more than doubled from just under 2 million a year to over 7 million (see Figure 1). Australian Football is the most heavily attended sport in Australia and fourth most attended sport in the world (Jakee et al. 2009). Additionally, through a monumental broadcasting deal in 2000, the AFL has become one of the most watched sporting events in Australia and the AFL Grand Final is the highest rated program within Australia (AFL 2010a). According to the 2009 AFL Annual Report, the AFL revenues were up to $303 million – a 1% increase from 2008 despite the economic downturn (AFL 2009a). Another AU$500 million broadcasting contract was signed in 2002 which lasted through 2006. An even larger deal was struck for the 2007-2011 seasons for $780

Figure 1. Total Attendance per Year from 1985 to 2007



million for domestic broadcasting, as well as an expansion in international broadcasting. This deal will largely increase the role that television marketing will play on the sport. In addition, it shows a large increase in potential revenues at both the club and league level.

Currently, the AFL is comprised of 16 clubs (See Table 1). Ten out of the 16 clubs are based in Victoria and all of the Victorian clubs, save Geelong, are based in Melbourne. Of those ten, there are four clubs that have come to be known as “The Big 4” due to their large revenue streams, long-standing rivalries, and decent field success (Booth 2007). While the majority of clubs are from Victoria, there is representation in almost every other state, ensuring that it is a national pastime. Two clubs are from Western Australia, two from South Australia, and one each from Queensland and New South Wales. In the last twenty years, the composition of the league has changed somewhat. The league comprised clubs with only three non-Victorian clubs until Adelaide joined in 1992. Throughout the 1990s, a few clubs were having trouble attracting crowds and were not financially stable. In 1996, the Fitzroy Lions merged with the Brisbane

Table 1: Clubs by Category

	Non-Victorian	Other Victorian	Big-Four
Club (Years in AFL)	Adelaide Crows (1992 – 2008)	Fitzroy Lions (up until 1996)	Carlton Blues
	Brisbane Bears (1987-1996)	Hawthorn Hawks	Collingwood Magpies
	Brisbane Lions (1996-2008)	Geelong Cats	Essendon
	Fremantle Dockers (1995-2008)	Melbourne Demons	Richmond Tigers
	Port Adelaide Power (1997-2008)	North Melbourne Kangaroos	
	Sydney Swans	St. Kilda Saints	
	West Coast Eagles	Western Bulldogs	

Bears to become the Brisbane Lions, which is still in the league today. By 1998, Port Adelaide and Fremantle joined the league, raising the overall total of clubs and reducing the ratio of Victorian to non-Victorian clubs.

All but one of the Victorian clubs are member owned. The North Melbourne Kangaroos is owned by share-holders (Booth 2007). Brisbane is also member-owned although they went through a short period of private ownership. The two clubs in Perth and Adelaide are owned by their respective state football commissions, and Sydney is licensed-owned by the AFL. Clubs raise revenue through sponsorships, club membership, AFL distributions and gaming. Collingwood stated that it received a total of $10,029,626 from AFL distributions and match returns in their 2009 financial report (AFL 2009c).

III. Sports League Objectives and Competitive Balance

In the sports industry, we the fans are the consumers of an entertainment product. The firms are the clubs and teams selling us their competition. The governing sports league itself is commonly modeled as a cartel, in which the privately-owned clubs or teams make decisions as one firm in order to maximize their objectives (Quirk and Fort 1995, Forrest et al. 2004). A league could have multiple objectives such as profit maximization, competitive balance, and win-maximization. In any other industry, the objective would mainly be to maximize profits, whereas sports leagues must find an optimal balance.

In the sports industry, where the main good being produced is the competition between the teams, the league is presumed to institute policies that foster competitive balance in the belief that uncertainty of outcome is one of the main determinants of demand. Booth (2007) calculates competitive balance values for each season from 1897 until 2003, and cross-examines these values between time periods of AFL policies aimed at increasing competitive balance. Booth argues that the times when competitive imbalanced peaked, the AFL began implementing policies such as salary caps and players drafts that ultimately evened out competitive balance. However the results of Jakee and Kenneally (2005) suggest otherwise. In finding that scheduling is determined by previous attendances rather than performance, Jakee and Kenneally suggest that the league is attempting to maximize attendance and television viewership rather than outcome uncertainty and competitive balance.

To complicate things further, many of the clubs in the AFL are privately owned, with members moving up in involvement as a result of how much money they contribute to the club. Members become emotionally and financially invested in the club and seek a return for their investment – a win! Thus there's an incentive at the club level (at least member-owned clubs) to be win-maximizing rather than profit-maximizing or working towards competitive balance (Booth 2007).

In a document published by the AFL, the AFL claims to have five main objectives. The first is financial viability, "to maximise the economic benefits for all key stakeholders" (AFL 2010d). The second is to even the competition so that "any club is capable of beating any other on any day or night…regardless of the relative financial strength of each club." The last three are to encourage community participation, build community and customer relations, and "work together as a collective."

Sports leagues have various objectives and constraints, as seen above, when designing a schedule for a season and many of these objectives can contradict each other. The process of scheduling games is essentially the league organizing their inputs in order to maximize a given output. As suggested above, a league aiming to find competitive or financial balance would maximize and equalize attendance at the club level, whereas a profit-maximizing league would maximize attendance at the league level. If scheduling itself is a decision variable of the league to organize its inputs, a test for its determinance of demand could indicate whether the league is promoting competitive balance, or whether they are profit maximizing. First, the attendance demand model would find whether time slots affect attendance and which slots attract the highest attendance. Second, the attendance demand model would find whether certain clubs or fixtures attract higher attendances. Lastly, an examination of the allocation of slots to clubs, such as research by Jakee et al. (2009) and Jakee and Kenneally (2009), can determine the league objective. If high-attendance clubs are scheduled at high-attendance time slots, this suggests a profit-maximizing objective. If low-attendance clubs are scheduled at high-attendance time slots, this suggests a balance objective.

IV. The Model

In the this section, I will explain the data set used, the empirical model, the variables used to describe the model, and the estimation technique.

A. Data Set

The availability of this data is due to Jakee and Keneally (2009). The original data set comprised game-day match attendance, home and away clubs, and points scored by each club over the seasons 1985 through 2008. Each football season consists of 22 rounds of 8 matches (with the exception of seasons 1991, 1992, and 1994 during which there were 24 rounds), with a series of finals matches. Altogether, the data set contained 3760 observations.

B. Model

This is a cross-sectional, time-series or panel data study. Following the model of Forrest and Simmons (2006) and Allan and Roy (2009), the model to be estimated using fixed effects is as follows:

$$ATTEND_{mft} = \beta_0 + \beta_1 PRICE + \beta_2 DISTANCE + \beta_3 DISTANCE^2 + \beta_4 HOMEFORM + \beta_5 AWAYFORM + \beta_6 VENUECAP + \beta_7 ATTEND_{t-1} + \beta_8 ROUND + \beta_9 FINAL + \beta_{10} ADJ + \beta_{11} COMPBAL + \delta_m [CLUB\ CAT] + \gamma_m [SCHEDULE] + e_i \quad (1)$$

where $ATTEND_{mft}$ refers to the natural logarithm of the game-day attendance for match, *m*, with fixture, *f*, in season, *t*. Using the natural logarithm of attendance allows the parameters to be interpreted as a percentage increase in attendance for an incremental unit change in the explanatory variable (for example, if price increases by $1, match attendance will increase by X%). This is useful to prevent misinterpretation from the variance that can be caused by certain clubs attracting a far greater level of attendance than others. As suggested above, the AFL now consists of 16 clubs, although during the 1986-1987 seasons, there were only 15. For each match there is a *fixture* of two clubs. A fixture is the discrete matching of two clubs, either home or away. For example, one fixture is defined to refer to matches between Adelaide and Carlton, another between Adelaide and Collingwood, yet another between Adelaide and Essendon, etc. Matches between Adelaide and Essendon played in Adelaide are grouped in the same fixture as matches between Essendon and Adelaide played in Melbourne.

C. Clubs

While using logarithms to scale attendance is likely enough to account for variances between clubs, there may still be some heteroskedasticity. This model needs to account for any differences between clubs from the State of Victoria, where Australian football originated, and those non-Victorian clubs that were created in the last few decades, as well as any Big Four distinctions. As the dependent variable is per match and fixture, I categorize the matches and fixtures into six different categories based on the classification of the home and away clubs as being either a Non-Victorian, Victorian, or a Big-four.[1] The term $\delta_m[CLUB\ CAT]$ in equation (1) then becomes the following:

[1] See Table 1 in the Appendix to see the exact breakdown of clubs into categories.

$$\delta_m[CLUB\ CAT] = \delta_0(NON\ vs\ NON) + \delta_1(NON\ vs\ OTHER) + \delta_2(NON\ vs\ BIG\text{-}4) + \delta_3(BIG\text{-}4\ vs\ BIG\text{-}4) + \delta_4(BIG\text{-}4\ vs\ OTHER) + \delta_5(OTHER\ vs\ OTHER) \quad (2)$$

A significant value for these parameters would indicate that scheduling affects the clubs differently. Also, it would indicate that the clubs within each group are viewed the same by fans.

D. Pricing

As data on ticket prices is hard to find, typically researchers use a proxy based on an average ticket revenue per person. Borland and Lye (1992) use just such a proxy. The variable *PRICE* in this model is the price of a general admission ticket at the gate over a season. General admission prices remain constant throughout the season. Ticket prices are adjusted to 2008 AUD.[2]

Price elasticities appear to be inconclusive in the literature. Borland and Lye (1992) and Garcia and Rodriguez (2002) found price to be slightly elastic. However, Coates and Humphreys (2007) used the Fan Cost Index, which measures not only ticket prices but also the prices of parking and concessions at NHL, MLB, NFL, and NBA games, giving the true cost of attending a sporting event. Coates and Humphreys (2007) confirmed the hypothesis that price is inelastic which is consistent with revenue maximization by monopoly clubs. Borland and Macdonald (2002) found that most significant price elasticity estimates are positively signed although the degree of elasticity varies with sport and estimation technique.

To measure the costs of attending a match beyond the price of admission, both Forrest and Simmons (2006) and Allan and Roy (2008) use *DISTANCE* and $DISTANCE^2$. This model also uses the quadratic form for distance. *DISTANCE* is the sum of the distances between the

[2] Prices are adjusted based on the CPI as reported by the Australian Bureau of Statistics.

home cities of the two clubs and the city of the venue. For most matches this is simply the distance between the home and away cities, in which case the measure for *DISTANCE* captures the cost of travel for fans of the away club to attend. Some matches in the AFL, however, are scheduled in cities away from both clubs, including the “home” club. These games reflect decisions made by the League to expand the interest and influence of the AFL. For these matches *DISTANCE* is measuring the travel costs for both “home” and away fans. In addition, a dummy variable, *EXPAND*, is included to account for these “Expansion” games.

Although macro variables such as median family income and population are sometimes used in attendance demand analysis, they are omitted in this model. A cross section analysis of the 2008 season revealed income and population to be statistically insignificant (See Table 2 in Appendix).

E. Quality of Match

1. Competitive Balance

To test whether competitive balance is a league objective, a scale of estimates for competitive balance will be used for *COMBAL*. The estimates were calculated per season from 1897 to 2003 by Booth (2007). Booth calculated the competitive balance values according to the Noll-Scully methods (1989) where,

$$COMBAL = \frac{\text{actual standard deviation of wins in the league}}{\text{idealized standarddeviation of wins in the league}} \quad (3)$$

The closer the value is to 1, the more balanced it is across the league. If fans value outcome uncertainty and thus competitive balance, we would expect to see a negative sign for this variable.

2. **Venue Capacity**

VENUE CAP refers to the capacity of the stadium. It must be included to account for the effect of stadium size on attendance. For high attendance matches, stadium size has a limiting effect on gate attendance whereas there is no effect on low attendance matches.

3. **Performance**

The variables for *HOMEFORM* and *AWAYFORM* refer to the performance of the home and away clubs, respectively. The performance of a club should have a positive effect on attendance. The better a club performs throughout the season, the more attendance that it should generate. This is also true with past seasons. If a team performed well in the last season, they are likely to have a greater fan base and thus greater attendance in the current season. *HOMEFORM* is calculated as the percentage of games won by the home club up to the beginning of the round for that match. For example, at the beginning of round 5 in the 2005 season, the performance of the home club, Port Adelaide, is .33, meaning they have won 3 out of the 10 previous matches in the 2005 season. In the first round of each season, home and away performances reflect the performance at the end of the previous season.

4. **Popularity**

A closely related variable is $ATTEND_{t-1}$ or the lagged attendance for that match. Lagged attendance serves as a measure of habitual attendance and favorability of a club. Empirical evidence supports the hypothesis that if a particular match was heavily attended the season before, it will likely be heavily attended in the current season (Borland and Lye 1992, Borland and MacDonald 2002). In this model, value of $ATTEND_{t-1}$ for match *m* and fixture *f* is the attendance for the last match played between those two clubs at the same venue (keeping home and away clubs consistent). For example, for the 1996 match between Sydney (home) and Geelong (away), the most recent match between the two clubs was in round 17 of 1995, but the most recent match between the two clubs played in *Sydney*, was in round 2 of 1995. Thus, the observed value of $ATTEND_{t\text{-}1}$ for the 1996 match between Sydney and Geelong played in Sydney, would be the attendance at the match 1995 between Sydney and Geelong, also played in Sydney.

F. Scheduling

The variable of interest – scheduling – is a series of dummies to examine the precise effect of scheduling on attendance. For each round, or week, matches are generally scheduled on weekends, beginning Friday night. However due to holidays and specials, some matches could be scheduled during the week. Jakee and Kenneally (2009) and Jakee et al. (2009) have grouped all games into five main scheduling slots: Friday night (*FRI*), Saturday (*SAT*), Saturday Night (*SATNIGHT*), Sunday (*SUN*), and Other (*OTHER*). Games classified in slot "Other" refer to those games scheduled on Monday through Wednesday for holidays, finals, or other distinctive reasons. The mean attendances per match and home club are calculated and displayed in Appendix A. After examining the data, it became clear that another slot would be needed for Sunday Night (*SUNNIGHT*) as the mean attendance for Sunday Night over all seasons appears to be significantly lower than Sunday.

To account for any intercept changes over all fixtures, dummy variables will be used for each time slot. A value of 1 for *FRI* specifies the match was scheduled for Friday, and a value of 0 for all other times. As Saturday games have the lowest mean attendance, Saturday will be the base time slot. The parameters for the other days will be interpreted to mean they are, or are not statistically different from scheduling on a Saturday.

Additionally, interactive terms will be tested to determine if there is a change in slope of scheduling over the categories of matches. The extended term $\gamma_m\,[SCHEDULE]$, from Equation (1) will be:

$$\gamma_n(scheduling) = \gamma_0(NON\ vs. OTHERVIC\ \times FRI) + \gamma_1(NON\ vs. OTHERVIC\ \times SATNIGHT) + \gamma_2(NON\ vs. OTHERVIC\ \times SUN) + \gamma_3(NON\ vs. OTHERVIC\ \times SUNNIGHT) + \gamma_4(NON\ vs. OTHERVIC\ \times OTHER) + \gamma_5(NON\ vs. BIG4\ \times FRI) + \gamma_6(NON\ vs. BIG4\ \times SATNIGHT) + \gamma_7\ (NON\ vs. BIG4\ \times SUN) + \gamma_7(NON\ vs. BIG4\ \times SUNNIGHT) + \gamma_9(NON\ vs. BIG4\ \times OTHER) + \gamma_{10}(OTHERVIC\ vs. OTHERVIC\ \times FRI) + \gamma_{11}(OTHERVIC\ vs. OTHERVIC\ \times SATNIGHT) + \gamma_{12}(OTHERVIC\ vs. OTHERVIC\ \times SUN) + \gamma_{13}(OTHERVIC\ vs. OTHERVIC\ \times SUNNIGHT) + \gamma_{14}(OTHERVIC\ vs. OTHERVIC\ \times OTHER) + \gamma_{15}(OTHERVIC\ vs. BIG4\ \times FRI) + \gamma_{16}(OTHERVIC\ vs. BIG4\ \times SATNIGHT) + \gamma_{17}(OTHERVIC\ vs. BIG4\ \times SUN) + \gamma_{18}(OTHERVIC\ vs. BIG4\ \times SUNNIGHT) + \gamma_{19}(OTHERVIC\ vs. BIG4\ \times OTHER) + \gamma_{20}(BIG4\ vs. BIG4\ \times SATNIGHT) + \gamma_{21}(BIG4\ vs. BIG4\ \times SUN) + \gamma_{22}(BIG4\ vs. BIG4\ \times FRI) + \gamma_{23}(BIG4\ vs. BIG4\ \times SUNNIGHT) + \gamma_{24}(BIG4\ vs. BIG4\ \times OTHER) \qquad (4)$$

G. Other variables

Three additional fixed variables are included to control for round, *ROUND*, adjacency, *ADJ*, and final matches, *FINAL*. *ROUND* is a sequential variable included to capture the trend of attendance throughout a season. Some attendance demand models have found that attendance increases the later the round in the season. And additional dummy, *FINAL*, will be used to delineate final matches. *FINAL* = 1 if the match is a semi-final, elimination final, preliminary, or Grand final. The last non-scheduling dummy variable is *ADJ*, adjacency. Certain rivalries exist due to proximity of the clubs. Nine clubs are based in Melbourne, two clubs out of Perth, and two in Adelaide. *ADJ* = 1 if the two clubs playing in the match are based out of the same city.

H. Estimation

Following the examples set forth in the literature, the regression will be estimated using a Ordinary Least Squares (OLS) estimation with Fixed Effects assumptions.

V. Results

In this section I will discuss the results of the model. For robustness, the model was estimated several times using different variables and/or proxies for separate measurements. In regression 1, all variables explicitly described in the model section were run over seasons 1985-2008. Saturday time slot was used as the base case for all regressions. Due do significance, the interactive variables were dropped in each subsequent regression. Regressions 2 and 3 are without competitive balance and over all seasons, whereas Regressions 4 and 5 are with competitive balance and only through season 2003. Regressions 2 and 4 use the dependent variable ln(*ATTEND*), where each coefficient can be interpreted as an elasticity. Regressions 3 and 5 use the dependent variable *ATTEND* (no log), where each coefficient is interpreted as the absolute change in the number of people attending per match. For ease of explanation, discussions are separated into sections by regression. For each regression I will discuss the significance of the variables and the implications.

Regression 1

In Table 2 below, I list the results for Regression 1. The dependent variable is $\ln(ATTEND)$. The base case is the Saturday time slot and the *NON vs. NON* fixture category; we therefore interpret the results as attendance elasticities in relation to the base case.

Immediately, we see that the scheduling variables have various degrees of significance. Only *SUNNIGHT* was statistically different from *SATURDAY* with a positive percentage change of 14%. This is the expected sign as we saw from the mean attendances over all of the seasons where Saturday was consistently lower in attendance over all seasons and clubs (Appendix A).

The dummies categorizing matches by types of fixtures show interesting results. We see significant estimates for *BIG 4 vs. BIG 4, NON vs. OTHER VIC*, and *OTHER VIC vs. OTHER VIC*. The highly positive estimate for *BIG 4 VS. BIG 4* suggests that the “Big Four” clubs (Collingwood, Carlton, Richmond, and Essendon) are still drawing the largest amount of spectators in comparison with other Victorian clubs and the non-Victorian clubs. Perhaps the more interesting aspect is the significant negative sign on both *NON vs. OTHER VIC* and *OTHER VIC vs. OTHER VIC.* As *NON vs. NON* is the base case, it appears the model is suggesting that the State of Victoria may no longer be dominant over Non-Victorian clubs in terms of attracting crowds.

The interactive variables testing for a change of slope effect of days across clubs has turned out to be insignificant. I conclude from this that there is no slope change, and that scheduling slots affect attendance equally across clubs.

The control variables for price, lagged attendance, distance, performance, are all significant but unexpected. Price has been found, as in Borland and Lye (1992), to have a positive coefficient indicating there might be a problem with the model. The parameter in this log-model shows that for a dollar increase in price, attendance rises by 1.7%. $ATTEND_{t-1}$ has a significantly large impact at 43.1%, as does home and away performance at 41.4% and 27.3%, respectively. While the difference in home and away performance is expected, as home performance is likely to have a stronger impact on attendance, these values appear to be overstated in this model. Distance is significantly zero. While this might be surprising, the control variable for expansion matches, might be responsible for the reduced impact of that variable.

Table 2: Regression 1

Dependent variable: ln(ATTEND)

R^2 = 0.58

N = 3758

	Coefficient	P-value
INTERCEPT	4.859*	.000
PRICE	.017**	.031
LN (ATTEND $_{T-1}$*)*	.431*	.000
DISTANCE (IN KM)	.000*	.000
[DISTANCE (IN KM)] ^{2}	.000*	.000
HOME PERFORMANCE	.414**	.019
AWAY PERFORMANCE	.273**	.018
YEAR	.012*	.002
ROUND	-.002*	.001
VENUE CAPACITY	.000*	.000
FINAL (D=1)	.267**	.035
ADJACENCY (D=1)	-.044**	.016
EXPANSION GAME (D=1)	-.464**	.036
OTHER	-.192	.483
FRIDAY	-.009	.913
SATURDAY NIGHT	.028	.596
SUNDAY	-.014	.789
SUNDAY NIGHT	.147***	.058
BIG 4 vs.. BIG 4	.224*	.000
NON vs. BIG 4	-.031	.551
NON vs. OTHER VIC	-.148*	.004
OTHER VIC vs. OTHER VIC	-.110**	.040
OTHER VIC vs. BIG 4	.032	.547
BIG 4 vs. BIG 4 × OTHER	.396	.159
BIG 4 vs. BIG 4 × FRI	-.002	.986
BIG 4 vs. BIG 4 × SATNIGHT	.000	.999
BIG 4 vs. BIG 4 × SUN X	.017	.815
BIG 4 vs. BIG 4 × SUNNIGHT	.178	.392
NON vs. BIG 4 × OTHER	.256	.372
NON vs. BIG 4 × FRI	.074	.406
NON vs. BIG 4 × SATNIGHT	.043	.496
NON vs. BIG 4 × SUN	.042	.476
NON vs. BIG 4 × SUNNIGHT	-.050	.626
NON vs. OTHER VIC × OTHER	.256	.365
NON vs. OTHER VIC × FRI	.135	.120
NON vs. OTHER VIC × SATNIGHT	.079	.185
NON vs. OTHER VIC × SUN	.062	.272
NON vs. OTHER VIC × SUNNIGHT	.025	.792
OTHER VIC vs. BIG 4 × OTHER	.501***	.071
OTHER VIC vs. BIG 4 × FRI	.145***	.092
OTHER VIC vs. BIG 4 × SATNIGHT	.026	.699
OTHER VIC vs. BIG 4 × SUN	.079	.172
OTHER VIC vs. BIG 4 × SUNNIGHT	-.195***	.075
OTHER VIC vs. OTHER VIC × OTHER	.425	.132
OTHER VIC vs. OTHER VIC × FRI	.121	.174
OTHER VIC vs. OTHER VIC × SATNIGHT	.011	.884
OTHER VIC vs. OTHER VIC × SUN	.063	.287
OTHER VIC vs. OTHER VIC × SUNNIGHT	-.144	.266

*significant at the 1% level **significant at the 5% level ***significant at the 10% level

Year and round are both significant. The year controls for the overall increase in attendance per year, which the model suggests at 1% per year, although actual calculated percentage increase per season is 5% on average over 1985 to 2008. The value of *ROUND*, -0.002%, suggests a slight decrease in attendance throughout a season, opposite the findings of Forrest and Simmons (2006) and Allan and Roy (2008) who found attendance to increase throughout a season. A final round, as expected, increases attendance by 26.7%. The negative coefficient for *ADJ*, -4.4%, suggests that, rather than closeness of clubs spurring rivalries and inciting attendance, a match with two clubs from the same area produces a crowding-out effect. The significantly large and negative estimate for expansion matches is as expected.

Regression 2

Due to the unexpected values of the coefficients of many of the variables, and the largely insignificant values of the interactive scheduling dummies, all of the interactive scheduling dummies are removed in the last four regressions. While the coefficients and signs of the control variables did not change considerably, the significance of the scheduling dummies sharply improved suggesting the validity of removing the interactive dummies. In Table 3, the results for Regressions 2 and 3 are listed.

All of the coefficients for the control variables are significant at the 1% level and the values are similar to those in Regression 1. *PRICE* is found, again, to have a positive coefficient at 1.6%. Lagged attendance, home performance, and away performance have higher than expected coefficients. Distance is significantly zero. However, in this regression, venue capacity has a higher than expected coefficient of 27.1%. This value may be overstated by the different venues. Melbourne Cricket Ground and Docklands Stadium have high stadium capacity and also tend to hold only highly-attended games. The *FINAL* coefficient is 27.1%. The negative coefficient

Table 3: Regressions 2 and 3

	Regression 2		**Regression 3**	
Dependent variable:	ln(ATTEND)		ATTEND	
R^2	.71		.70	
N	3758		3758	
	Coefficient	P-value	Coefficient	P-value
INTERCEPT	4.798*	.000	-3169.909	.355
REAL PRICE	.016**	.041	-52.951	.824
LN (ATTEND $_{T-1}$*)*	.434*	.000		
ATTEND $_{T-1}$			.357*	.000
DISTANCE (IN KM)	.000*	.000	-2.071*	.000
[DISTANCE (IN KM)]^2	.000*	.001	.000*	.000
HOME PERFORMANCE	.413*	.000	11828.126*	.000
AWAY PERFORMANCE	.274*	.000	8189.323*	.000
YEAR	.012*	.000	440.952*	.000
ROUND	-.002*	.003	-18.611	.387
FINAL (D=1)	.271*	.000	14531.109*	.000
VENUE CAPACITY	.000*	.000	.140*	.000
ADJACENCY (D=1)	-.044*	.005	-1657.511*	.001
EXPANSION GAME	-.462*	.000	-8650.604*	.000
OTHER	.219*	.000	8894.175*	.000
FRIDAY	.098*	.000	3488.170*	.000
SATURDAY NIGHT	.082*	.000	2670.362*	.000
SUNDAY	.043*	.000	1615.981*	.000
SUNDAY NIGHT	.117*	.000	3658.869*	.000
BIG 4 vs.. BIG 4	.240*	.000	12552.072*	.000
NON vs. BIG 4	.002	.919	-367.325	.522
NON vs. OTHER VIC	-.090*	.000	-2890.935*	.000
OTHER VIC vs. OTHER	-.062**	.013	-2307.524*	.003
OTHER VIC vs. BIG 4	.090*	.000	3080.901*	.000

*significant at the 1% level **significant at the 5% level ***significant at the 10%

for adjacency is still -4.4%.

With this new model without the interactive variables, we can now see a precise scale of which time slots draw larger crowds, and how much larger. All of the day-of-the-week coefficients are positive and significant at the 1% level, suggesting that Saturday is indeed the lowest attended slot. The *OTHER* time slot is the highest attended slots as expected. Since games scheduled on days other than the weekend are typically on holidays or special events, we would expect attendance to be higher on those days. In the literature, both Shofield (1983) and Garcia and Rodriguez (2002) also find holidays more highly attended.

The club dummies are all significant at the 1% level except for *NON vs. BIG 4*. As the base case is still the Saturday time slot and the *NON vs. NON* fixture, we can interpret this to mean that the number attending a *NON vs. BIG 4* game is insignificantly different from a *NON v.s NON.* The signs are the same for the club dummies as in Regression 1. Big 4 matches draw the highest attendance, and Other Victorian clubs draw the lowest.

Regression 3

In this regression, I remove the logarithms and run a straight linear regression. Interpreting the results in this way allows us to see the marginal increase in attendance with an increase in the variable. Relative magnitudes and signs are the same for most. The exceptions include price, distance, and lagged attendance. *PRICE* is now negatively signed but insignificant. *DISTANCE* shows the negative coefficient that was expected. The marginal drop in attendance per increase in kilometer is 2 attendees. Contrary to the significant effect of past attendance on current attendance in Regression 1 and 2, $ATTEND_{t-1}$ here proves to be almost negligible.

Table 4: Regressions 4 and 5

	Regression 4		Regression 5	
Dependent variable:	ln(ATTEND)		ATTEND	
R^2	.80		.80	
N	2838		2838	
	Coefficient	P-value	Coefficient	P-value
INTERCEPT	5.435*	.000	15032.265*	.001
COMP. BALANCE	-.132*	.000	-3707.065*	.000
REAL PRICE	-.009	.358	-749.354**	.013
LN (ATTEND $_{T-1}$)	.436*	.000		
ATTEND $_{T-1}$			.360*	.000
DISTANCE (IN KM)	.000*	.000	-6.708*	.000
[DISTANCE (IN KM)]^2	.000*	.000	.001*	.000
HOME PERFORMANCE	.450*	.000	12281.885*	.000
AWAY PERFORMANCE	.291*	.000	8773.699*	.000
YEAR	.019*	.000	659.509*	.000
ROUND	-.003*	.002	-17.201*	.484
VENUE CAPACITY	.000*	.000	.137*	.000
FINAL (D=1)	.254*	.000	13677.239*	.000
ADJACENCY (D=1)	-.072*	.000	-2147.166*	.000
EXPANSION GAME	-.264*	.000	-3644.782***	.057
OTHER	.231*	.000	8860.425*	.000
FRIDAY	.080*	.000	2790.316*	.000
SATURDAY NIGHT	.119*	.000	3459.846*	.000
SUNDAY	.052*	.000	1945.296*	.000
SUNDAY NIGHT	.194*	.000	5758.144*	.000
BIG 4 vs.. BIG 4	.147*	.000	9812.892*	.000
NON vs. BIG 4	.015	.544	-7.827	.991
NON vs. OTHER VIC	-.082*	.000	-2342.226*	.000
OTHER VIC vs. OTHER	-.154*	.000	-4796.937*	.000
OTHER VIC vs. BIG 4	-.002	.956	418.462	.684

*significant at the 1% level **significant at the 5% level ***significant at the 10%

Regressions 4 and 5

The results for Regressions 4 and 5 are listed in Table 4. In Regressions 4 and 5, I add competitive balance to the model.[3] Regression 4 is a log-linear model as in Regressions 1 and 2, with the dependent variable ln(*ATTEND*). Regression 5 is a linear model with the dependent variable *ATTEND*. With an R^2 of 0.8, both Regression 4 and Regression 5 are more significant than the previous models, although Regression 5 is the preferred regression due to the significance of all its variables and expected signs.

In Regression 5, competitive balance (*COMPBAL*) has a strong negative value of -3707.065, suggesting that competitive balance and outcome uncertainty are important to fans. Recall that competitive balance is the ratio of actual to ideal standard deviations of homes games (see page 15). This means that the higher the value of the competitive balance measure, actual balance lowers. So the parameter for competitive balance is actually measuring the effect on attendance as *imbalance* increases.

Contrary to early models, *PRICE* is significantly negative at -749.35 suggesting that attendance is slightly elastic to price. The coefficient for *DISTANCE*, -6.7, is the expected value. Home and away performance are both significantly positive. For a percentage increase in home games won, you would expect to see a rise in attendance by 12,281 and for a percentage increase in away games won, you would expect to see a rise in attendance by 8774. While the *YEAR* coefficient is positive, we would expect a high coefficient than 659.5. *ROUND* is no longer significant. Venue capacity is almost negligent. Final games have an increased attendance by 13,677. The coefficient for *ADJACENCY*, again, points toward a crowding out effect between clubs

[3] Note that the number of observations in Regressions 4 and 5 has dropped by 920. This is due to the fact that Booth's calculations only went through season 2003.

Table 5: Rank of Time Slot from Greatest Attendance to Least

Day	Coefficient
Other	8860
Sunday Night	5758
Saturday Night	3459
Friday	2790
Sunday	1945
Saturday	*Base Case

in the same city rather than a rivalry effect. Expansion games have a significant negative coefficient of -3645.

The scheduling and club dummies have stayed relatively the same, although now Friday nights draw a smaller crowd than Saturday nights. By this regression, the time slots can be ranked by their ability to draw crowds. In this model, the ranks of attendance by day goes Saturday < Sunday < Friday < Saturday Night < Other (see Table 5). We can also rank the club fixtures by their ability to draw crowds (See Table 6). By ranking them this way, we can see that Big 4 games still draw larger crowds than others. By that same token, we can see that games between only Victorian clubs draw the smallest crowds. The rankings suggest that Victorian clubs may no longer be the dominant clubs in the league, and the AFL expansion policies of the 1990s worked if their goal was to increase the balance of attendance by club.

Table 6: Rank of Club Fixture from Greatest Attendance to Least

Fixture	Coefficient
BIG 4 vs. BIG 4	9813
NON vs. BIG 4	Not statistically different from *NON vs. NON*
NON vs. NON	*Base Case
OTHER VIC vs. BIG 4	Not statistically different from *NON vs. NON*
NON vs. OTHER VIC	-2342
OTHER VIC vs. OTHER VIC	-4797

VI. Conclusion

From the five regressions, I found that price, distance, performance, year, final matches, adjacency, and expansion were all significant.

This analysis makes it clear that scheduling is indeed extremely important to attendance demand. These findings prove that not only does the day and time of the schedule slot affect demand, but certain fixtures draw higher crowds relative to others. Specific to the AFL, you can conclude that the “Big 4” clubs are still predominantly the highest crowd attractors, but also that the other Victorian clubs attract significantly less crowds than the non Victorian clubs from New South Wales, Queensland, and West Australia. This suggests that the AFL is already a more national league than regional, and the expansion policies during the 1990s worked to increase representation outside of the state of Victoria.

Furthermore, in conjunction with the findings of Jakee et al. (2009) and Jakee and Kenneally (2009), the implications of my model suggest that the AFL pursues a more profit-maximizing objective than a competitive balance objective. Recall that Jakee et al. (2009) found asymmetries in the allocation of slots to certain clubs. In fact, some clubs were receiving far more favorable slots than others. If there are asymmetries in the allocation of scheduled time slots, and certain time slots and fixtures generate higher demand, and therefore revenue, as the research put forth in this paper suggests, it follows that the AFL is scheduling asymmetrically in order to maximize attendance, and therefore revenue.

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Appendix A

Mean Attendance by Home Club over all seasons							
	Other	Fri	Sat	Sat Night	Sun	Sun Night	Mean
Fitzroy Lions	16085	8827	12710	0	11836	0	8243
Brisbane Bears	0	16985	12615	11703	10274	0	8596
Sydney Swans	0	18667	0	25231	20224	9743	12311
Brisbane Lions	29497	27808	0	28534	25373	0	18535
Geelong Cats	34377	29869	23965	45007	27959	0	26863
Western Bulldogs	24165	39688	19059	25490	23918	30792	27185
N. Melb. Kangaroos	32652	32713	22522	26220	22994	26789	27315
Fremantle Dockers	21132	31116	33312	27889	27349	25637	27739
Port Adelaide Power	28206	33685	30760	30035	31579	26605	30145
Hawthorn Haws	29337	42739	25574	27676	28866	38276	32078
Melbourne Demons	48389	32390	30555	32921	29936	28648	33807
West Coast Eagles	39155	27566	38682	35168	31849	38127	35091
St. Kilda Saints	38087	42068	24120	35887	29343	41069	35096
Richmond Tigers	43446	36111	30888	35618	32564	33702	35388
Adelaide Crows	37661	41627	41070	40834	41249	41904	40724
Carlton Blues	48503	54005	27714	36514	37748	59847	44055
Essendon Bombers	65263	49078	34029	46397	42656	54346	48628
Collingwood Magpies	63078	55189	35362	50124	46449	47567	49628
Mean	33280	34452	24608	31180	29009	27947	30079

Appendix B: References Grouped by Section

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