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# ESTIMATING THE VALUE OF PROVINCIAL RUGBY IN NEW ZEALAND: THE CASE OF WANGANUI

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# ESTIMATING THE VALUE OF PROVINCIAL RUGBY IN NEW ZEALAND: THE CASE OF WANGANUI

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## ABSTRACT

A model of attendance for provincial rugby in New Zealand is estimated by considering representative games played in Wanganui from 1972 to 1994. The model is comparable with similar studies in that it encapsulates economic and sport-specific dimensions of game attendance. The price elasticity of demand for rugby was found to be between -0.5 and -0.66, results that are consistent with several similar studies in the literature, and suggests a price-setting focus on utility maximisation rather than profit maximisation. Traditional rivalry and playoff games generated significant increases in attendance. The creation of various National Provincial Championship (NPC) division structures resulted in spectators attending in greater numbers for games of a lower quality (i.e. lower division). The implication of this finding is clear – more spectators attended games in which there was a greater chance that the local team would win. Average consumer surplus between 1991 and 1994 accruing to Wanganui spectators was derived from the demand analysis, and was found to be approximately $102,000 per year. The net present value of private consumption benefits to local residents generated by rugby in Wanganui was estimated at approximately $875,000, suggesting that there is some justification for local government involvement in financing a rugby-only facility in the city.

**Keywords**: Consumer surplus; rugby; demand estimation; sports facilities

JEL Classification: L83

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## 1. INTRODUCTION

Independent empirical examination of ex-post economic impacts of facilities and events has called into question the accuracy of studies that have projected significant impacts such as job creation and increased economic activity (Baade, 1987; Baade, Baumann, and Matheson, 2008; Baade and Dye, 1990; Baade and Matheson, 2004; Coates and Humphreys, 1999), and argued that such studies should not be used as justification for public sector involvement in such projects (Richardson, 2012). The focus in more recent research within the literature has been on the nature and role of intangible benefits associated with facilities and events to justify government involvement in stadium construction (Crompton, 2004; Johnson and Whitehead, 2000; Santo, 2007; Schwester, 2007).

The context for this analysis involved a facility development in the New Zealand city of Wanganui. The Wanganui Rugby Football Union moved provincial representative rugby fixtures from their traditional home ground of Spriggens Park to the Cooks Gardens facility in 1996 after the main grandstand at Spriggens Park was destroyed by fire. The Cooks Gardens stadium was upgraded in 1996 with a new (main) Northern grandstand, among other upgrades. The upgrade of the Northern stand was funded with substantial local government assistance.

The economically justifiable rationale behind local government financing of sporting facilities is that stadiums and events generate economic benefits to local economies. Economic benefits can accrue from event attendance (consumer surplus), from spending of non-locals at events (producer surplus), as well as possible spillover benefits (public goods) enjoyed by both attendees and non-attendees. While there is general acceptance within the literature that producer surplus benefits are typically overstated in the form of economic impacts (Noll and Zimbalist, 1997), consumer surplus benefits are being given greater consideration.

The measurement of consumer surplus typically involves the estimation of consumer demand. The development of a model of attendance that incorporates economic and sports-related factors is therefore the first step in this analysis, with the second step being the estimation of consumer surplus benefits of attendance from the most appropriate functional form of the demand model. The estimated consumer surplus benefits are then compared to the cost of the Wanganui District Council's $260,000 contribution towards the upgrade of the multiple-purpose Cooks Gardens facility. If these benefits exceed the cost, then there is economic justification for the council's contribution.

This analysis proceeds in the following manner. A brief history of rugby in Wanganui, including the devlopment of facilities in the city is presented in Section 2, and the history of the structure of competition of provincial rugby in New Zealand is outlined in Section 3. Relevant literature specific to this analysis is briefly reviewed in Section 4. The development of the empirical model and discussion of the data takes place in Section 5, and the results are discussed in Section 6. From the empirical analysis, estimates of consumer surplus are derived and discussed in Section 7. The paper is concluded in Section 8.

## 2. RUGBY IN WANGANUI: A BRIEF HISTORY

The history of rugby in Wanganui began in 1872 with the first game played in the area, two years after rugby was introduced in New Zealand. The Wanganui Rugby Football Union was established in 1888 to improve the administration of the game in the area (Johnston, 1988). The history of representative games in Wanganui began that year with a game against the touring British team, the result being a draw with both teams scoring one try (Johnston, 1988). Wanganui played their 1000$^{th}$ representative game in May of 1996, a 26-all draw with neighbours and traditional rivals Taranaki, in Wanganui.

For a detailed history of Wanganui rugby, see Johnston (1988). The Wanganui union has produced 17 All Blacks (New Zealand representatives) throughout its history, with the most recent being midfield back Bill Osborne (1975-82) and halfback Andrew Donald (1981-1984).

Wanganui played their home games at Spriggens Park until 1996, a venue regarded by the prominent New Zealand rugby journalist Sir Terry McLean as "…a wet weather field without peer in the entire country" (Garland, 1997, p. 46). In 1995, the main grandstand at Spriggens Park was destroyed by fire. The damage to the stand cost the Wanganui Rugby Football Union, as the owners of the facility, in excess of $60,000. The Union was faced with a choice – to pay for the upgrade and continue to play at Spriggens Park, or to move representative fixtures to the other major facility in Wanganui, Cooks Gardens. The upgrade would have had a significant financial impact on the union, so it was decided that the Union would sell the ground to the Wanganui District Council, while retaining ownership of some of the buildings within the facility. The Union rented Spriggens Park off the Council for club rugby purposes, and moved the representative fixtures to Cooks Gardens in 1996.

Cooks Gardens is a well-established multiple-purpose sporting facility in the city that also hosted sporting events such as athletics and cycling. Its combined replacement value in 2009 was $11.6 million, with the Stadium worth $7.865 million and the Velodrome worth $3.735 million (Wanganui District Council, 2009, p. 1837). When the Union moved to Cooks Gardens, the facility was not well-suited for rugby, a point made in the Union's 1996 Annual Report. In 1996, however, major developments were undertaken at Cooks Gardens, including the construction of a new cycling velodrome to replace the cycling track that encompassed the playing field, the laying of an artificial (synthetic) athletic track where the old cycling track previously sat, and a new main northern grandstand that provided in excess of 2,300 new seats. The facility was further upgraded in 2004 with over 1,100 new seats in two new grandstands, including the southern stand which was built to house the offices of the Rugby Union and changing facilities (Wanganui District Council, 2009). The facility at present has an official capacity of 15,000.

## 3. A BRIEF HISTORY OF THE NATIONAL PROVINCIAL CHAMPIONSHIP

Prior to 1976, regular home and away matches were organised between provincial unions that generated rivalry and normally attracted good crowds (Garland, 1997). The major annual event on the Wanganui rugby fixtures list were the games against neighbouring Taranaki – in New Plymouth on Anzac Day and the return clash in Wanganui on Queen's Birthday. With the exception of the rivalries developed through these types of games, Ranfurly Shield clashes and international matches, it was noted that, in general "…when playing an opposition more at their own level of ability it often seemed that [teams] were going through the motions" (Garland, 1997, p. 3).

The combination of the need to bring meaning to these types of games, the escalating costs of administration in the mid-1970s and the effect of the cancellation of the 1973 South African tour to New Zealand on the wealth of the New Zealand Rugby Football Union resulted in the formation of a two-tiered inter-provincial rugby competition in New Zealand in 1976 (Garland, 1997). Romanos (2002) noted that the formal proposal for the NPC was made by Wanganui delegates Buddy Stevenson and Paul Mitchell. Part of the reason for the choice of the Wanganui delegates was the fact that the All Black coach at the time, J.J. Stewart, was from Wanganui, and Wanganui's nominee on the NZRFU executive, Bob Stuart, was a former All Black captain (Romanos, 2002).

The proposed format of the NPC was a First Division that consisted of 11 teams, and a Second Division for the remaining fifteen unions that was separated into North and South Island divisions, with the initial aim of fostering and protecting the interests of South Island rugby. This structure was modified in 1985, when the Second Division was combined, and a separate Third Division was created. For its initial year, the Third Division was split into North and South divisions. From 1986-2005, the format of the NPC was three separate divisions based entirely on playing strength. In 1992, the present playoff structure was implemented, whereby the top four teams in each division played in two semi-finals and the winners met in a final to decide the division champion. Winners of Division Three were automatically promoted to Division Two at the expense of the last-placed Division Two union.

The competition structure changed once more in 2006, with the expansion of the First Division to a new Premier division and the merging of the remainder of the Second and Third Divisions to a new Heartland championship. Wanganui has played in the Heartland championship since its inception in 2006 with outstanding results, including winning the championship's Meads Cup in 2008, 2009 and 2011.

## 4. LITERATURE REVIEW

An excellent survey of the literature of demand for sport was conducted by Borland and Macdonald (2003), who examined 57 studies of sports including soccer, the four United States (U.S.) major league sports (baseball, basketball, football (gridiron) and ice hockey), rugby league, Australian rules football and cricket. Five general categories of determinants of demand were identified as being prominent across the studies, namely (i) consumer preferences, (ii) economic characteristics, (iii) quality of viewing, (iv) characteristics of the sporting contest, and (v) supply capacity (Borland and Macdonald, 2003).

Demand for rugby union – unlike the four U.S. major league sports, as well as soccer, cricket and rugby league – is largely unexplored territory in the literature. Jones, Schofield and Giles (2000) noted in their study of demand for British Rugby League that the absence of a study of demand for rugby reflected

> "…the amateurish (deliberately?) reporting of attendance and financial data for this heretofore 'amateur' game. Presumably this will change with the professionalization of the game" (Jones, Schofield, and Giles, 2000, p. 1877).

Two previous studies have concentrated on the modelling of rugby attendance in New Zealand – Owen and Weatherston (2004a, 2004b). Owen and Weatherston's (2004a) study provided a unique insight into the key determinants of Super 12 rugby attendance in New Zealand. These were found to be habit (lagged attendance), traditional rivalries, quality of rugby, the weather (rain on the day of the match), and the stage of the season that the match was played. Very little evidence was found to support the hypothesis that individual match uncertainty of outcome influenced attendance (Owen and Weatherston, 2004a). Similar results were found for attendances at NPC First Division games (Owen and Weatherston, 2004b). In both studies, economic variables were found to be important determinants of attendance.

A recent extension to empirical demand studies has been the estimation of consumption benefits generated by sports teams through the calculation of consumer surplus. This has been prompted by the increasing tendency of local governments (predominantly in the U.S.) to publicly fund sports facilities largely on the grounds of projections of substantial economic impacts accruing from such projects. Two studies have attempted to measure the consumption benefits, or consumer surplus, of sport to a city (Alexander, Kern, and Neill, 2000; Irani, 1997). Irani (1997) estimated a Marshallian demand curve for Major League Baseball games in the U.S., and calculated net consumer surplus from the estimated demand curve. Alexander, et al., (2000) attempted to avoid issues with estimating demand by adopting a theoretical approach and estimated consumer surplus using assumed demand elasticities.

Irani (1997) estimated annual net benefits to cities hosting Major League baseball franchises from -$19.1 million to $32.8 million, and advocated that consumer surplus values be included as a measure of consumer welfare in any decision of whether or not to subsidise a franchise. Alexander, et al., (2000) found that for most U.S. major league sports franchises, consumers

surplus values from attending games were insufficient to justify building facilities at 100% public expense on benefit-cost grounds (Alexander, et al., 2000).

More recent studies have examined the value of public goods, or non-use values, generated by stadiums and teams and have found similar results to the earlier studies; while public good benefits were found to exist, they were insufficient to justify the extent of the public subsidisation of teams and facilities experienced in the United States (Groothuis, Johnson, and Whitehead, 2004; Johnson, Groothuis, and Whitehead, 2001; Johnson, Mondello, and Whitehead, 2007; Johnson and Whitehead, 2000).

An examination of the consumer surplus benefits generated by sporting events provides important information that can be used in a benefit-cost analysis of government involvement in facility construction. A complete benefit-cost analysis would account for both use and non-use benefits of a facility (Hyman, 2005). Knowledge of the value of use benefits (in this case, the consumer surplus benefits) and the project costs can, nevertheless, provide an indication of the size of public good or non-use values necessary to justify complete subsidisation of a sporting facility in the absence of producer surplus benefits.

In this study, consumer surplus values are calculated and discussed in Section 7. Before these values can be considered, an empirical model needs to be formulated to evaluate the importance of several key determinants of attendance. This model is developed in the next section.

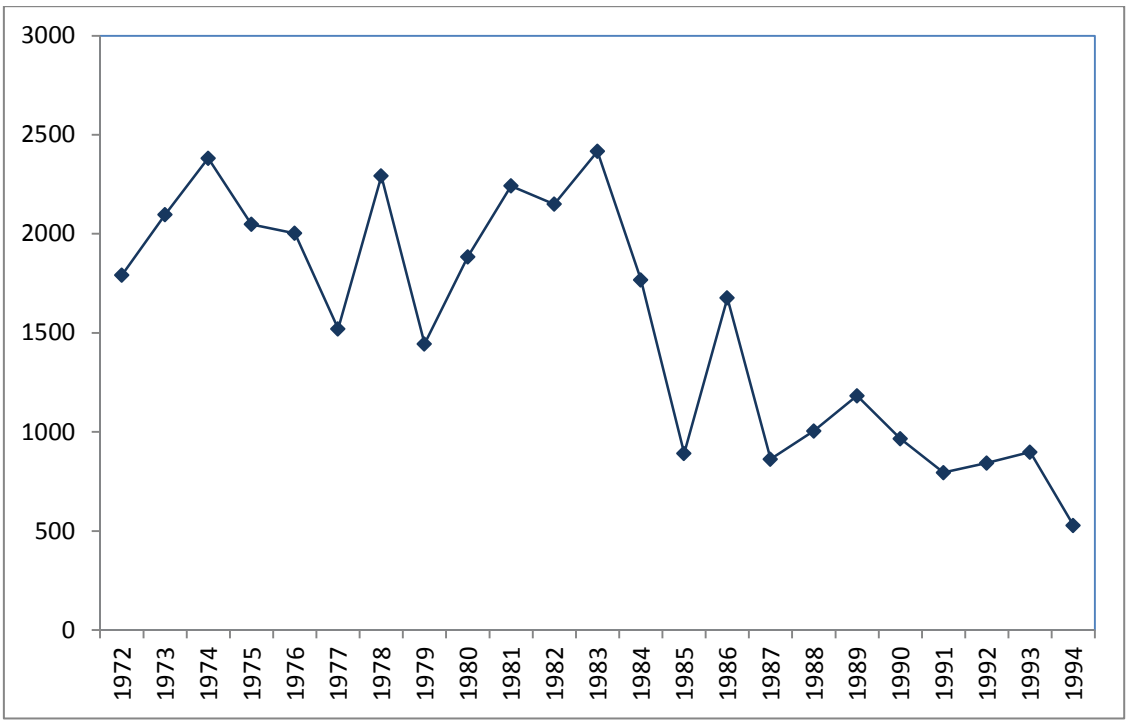
## 5. METHODOLOGY

The model developed for this study is derived from consumer theory and draws from a well-established field of literature. The model structure factors in the general determinants of demand as suggested by Borland and Macdonald (2003). The basic model is shown in equation 1.

$$ATT_{it} = \alpha_i X_{it}^{E} + \beta_i X_{it}^{CP} + \delta_{it} X_{it}^{CSC} + e_{it} \qquad (1)$$

The dependent variable is $ATT_{it}$, the attendance at Wanganui home game *i* at time *t*. Average attendance for the period under examination is presented in Figure 1 below. There is clearly a negative trend in attendance between 1972 and 1994, although there have been several fluctuations during this period.

**Figure 1: Average Attendance at Games in Wanganui, 1972-1994**




Source: Wanganui Rugby Football Union Annual Reports, various years.

The independent variables are divided into several groups. Firstly, there is a vector of economic variables, $X_{it}^{E}$, which include real average attendance price (*REAL_PRICE*), the distance from the visiting team's home city to Wanganui (*DIST_HRS*), monthly registered unemployment (*WMRU*) and the presence of a substitute good, Sky Television (*SKY*).

The real average attendance price is calculated as total gate revenue divided by total game attendance, converted into 1999 dollars with consumer price index (CPI) figures. No information regarding season ticket holders was available, so this measure of ticket price is the best available measure of entry price. Past research has indicated that it is reasonable to

expect the coefficient of real price to be negative and inelastic. The distance variable is calculated by taking the distance of a one way trip in hours from Wanganui to the city or town in which visiting unions played their home games. The distance effect is expected to be negative, that is, the further away the opposition is from Wanganui, the lower the attendance is expected to be.

The monthly registered unemployment figures for the Wanganui district (*WMRU*) is included to control for local macroeconomic influences in the absence of per-capita income measures. Borland and Macdonald (2003) suggested that attending sports may well be an outlet for the unemployed, and that attendance could theoretically be positively related to measures of unemployment.

Economists almost always acknowledge the role of substitutes as being crucial to any decision made by consumers and producers. In this instance, to incorporate a substitute for attending games of rugby in Wanganui, a dummy variable indicating the presence of Sky Television in New Zealand (*SKY*) is factored into the model. Sky Television introduced pay-per-view television to New Zealand in 1990, and, as a result, people had an alternative to watching rugby in Wanganui. While Wanganui rugby games were not televised, Sky nonetheless enabled an increased variety of national and international sport to be beamed into New Zealand homes, in addition to other programmes, including movies. Thus, one might anticipate that the presence of Sky would result in lower attendances at rugby matches in Wanganui.

The second vector of variables, $X_{it}^{CP}$, represents consumer preferences, and includes lagged attendance ($ATT_{i-1,t}$) as a measure of habit persistence or team loyalty.[2] Failure to consider the effect of habit on attendance can potentially result in autocorrelation (Borland and Macdonald, 2003).[3] One would expect lagged attendance to be positively related to current attendance.

The third group of variables, $X_{it}^{CSC}$, represents characteristics of the sporting contest and quality of viewing, and includes dummy variables representing the annual Queen's Birthday fixtures between Wanganui and Taranaki (*TARA*), the level of NPC games played (*DIV2NI*, *DIV2*, *DIV3*), international-level opposition (*INT_T1*), playoff games (*DIV3SF*, *DIV3F*), promotion (*PROMPY*) and relegation (*RELPY*) variables, as well as dummy variables for each stage of the NPC's history (*PRENPC*, *NPC1*, *NPC2*, *NPC3*, and *NPC4*).

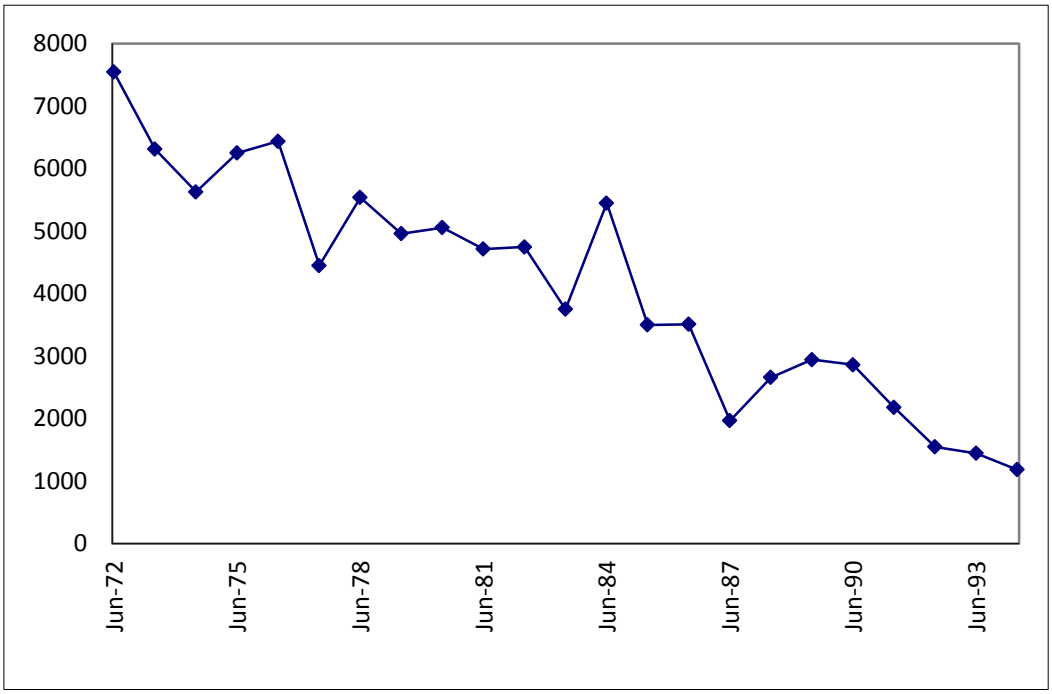
As mentioned earlier, the annual fixtures against Taranaki were a constant feature throughout the sample period, and have typically been the most popularly attended games each season, especially since the Taranaki game was played on a public holiday (Queen's Birthday). Annual attendances at this fixture between 1972 and 1994 can be seen in Figure 2. To this

[2] Given that *i* is the game in year *t*, the appropriate nomenclature of lagged attendance in this model is Attendance in the $i$-1$^{th}$ game in year *t*.

[3] In each specification of the model estimated in this analysis, tests were conducted for the presence of autocorrelation in the absence of a lagged attendance variable. Tests indicated that autocorrelation was present, so the lagged attendance variable was included in each model specification.

end, the dummy variable *TARA* is assigned to this fixture each year. Attendances at this fixture follow a similar trend to the overall average attendances shown in Figure 1.

**Figure 2: Attendance at Wanganui vs Taranaki (Queen's Birthday) Games**




Source: Wanganui Rugby Football Union Annual Reports, various years.

The effect of the level of games played in the NPC has also been considered, and the impacts on attendance are hypothesised to differ between divisions. On one hand, second division rugby (*DIV2NI*, *DIV2*) is a higher standard than third division rugby (*DIV3*), so higher interest could be generated due to the higher level of play. On the other hand, Wanganui have consistently performed well in Division 3 (winning and thus being promoted from the division twice in the sample period as well as consistently making the playoff stages), as opposed to being one of the poorer performed Division 2 teams (relegated to Division Three twice and never making the second division playoffs). To that end, variables to capture the effects of promotion to (*PROMPY*) and relegation from (*RELPY*) Division 2 in the previous year have also been included to capture any effect of performance in the previous season that might have affected attendance in the present season. Wanganui has also hosted semi-finals of Division 3 (*DIV3SF*) and a Division 3 final (*DIV3F*) during this period, and the effects are captured with dummy variables for these games.

Wanganui played several international teams across the sample period (*INT_T1*) and these included games against South Africa, Australia the British Isles, Fiji, Western Samoa and Tonga, so one would expect interest in these games to generate substantial increases in attendance relative to games against domestic opposition.

Dummy variables are also included to capture the impact of the introduction and change of format or structure of the NPC on attendance (*PRENPC*, *NPC1*, *NPC2*, *NPC3* and *NPC4*),

where *PRENPC* denoted pre-NPC games, and each of the *NPC* variables are associated with the respective structural changes in the National Provincial Championship as outlined earlier in Section 3. One would expect that games played in a competition format as opposed to "friendlies" would generate higher attendance if spectators favoured games between sides of relatively even strength. Likewise, the introduction of semifinals and finals in 1992 meant that four places became available within each division, possibly generating greater spectator interest with the presence of a more inclusive playoff race.

A time trend (*TIME*) is also included in the model due to the nature of the dependent attendance variable, as well as a within-season game trend (*GAME*). The purpose of these variables is to control for both season-to-season as well as within-season time trends. The time of the week that each game was played is also controlled for with a dummy variable (*MWK*), which equals 1 if the game was played on a week day, and zero if the game was played in the weekend (most games were played on the weekends).

The general form of the model to be estimated is as shown in equation 2 below.

$$\begin{aligned} ATT_{it} &= \alpha_0 + \alpha_1 REAL\_PRICE_{it} + \alpha_2 DIST\_HRS_{it} + \alpha_3 WMRU_{it} + \beta_1 ATT_{i,t-1} \\ &+ \delta_1 TARA_{it} + \delta_2 DIV2NI_{it} + \delta_3 DIV2_{it} + \delta_4 DIV3_{it} + \delta_5 INT\_T1_{it} + \delta_6 DIV3SF_{it} \\ &+ \delta_7 DIV3F_{it} + \delta_8 PROMPY_t + \delta_9 RELPY_t + \delta_{10} PRENPC_t + \delta_{11} NPC1_t + \delta_{12} NPC3_t \\ &+ \delta_{13} NPC4_t + \delta_{14} SKY_t + \delta_{15} TIME_t + \delta_{16} GAME_t + \delta_{17} MWK_t + e_{it} \end{aligned} \tag{2}$$

Of the NPC format variables, *NPC2* is dropped from the model to avoid the identification problem. Determination of the suitability of each of the variables and the implications for model selection are discussed in the next section.

### 5.1. Data

The data set consists of 194 individual Wanganui home game observations between the 1972 and 1994 seasons. The author was fortunate to be given access to historical Wanganui rugby financial data which was (and remains) commercially sensitive. The reporting of game-by-game financial information and attendances in Annual Reports for each of the 22 years is rare. As such, this was a unique opportunity to examine the nature of attendance and consumer surplus benefits for a lower-level provincial union. The data series stopped in 1994 because the information was no longer reported from 1995 onwards. The variables, definitions, data sources, and summary statistics are as shown in Table 1.

**Table 1: Variables, Definitions, Source and Summary Statistics**

| Variable | Definition | Data Source | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|
| ATT | Attendance | Wanganui Rugby Football Union (WRFU) Annual Reports 1972-1994 | 1546.789 | 1786.981 | 81 | 12135 |
| REAL_PRICE | Real average price[4] | WRFU Annual Reports 1972-1994 (ticket price) | 5.737 | 1.302 | 3.281 | 12.624 |
| DIST_HRS | Distance from Wanganui t visiting team's home city/town | AA Driving Times and Distance Calculator http://aatravel.co.nz/main/tdcalculator.php (distance from Wanganui in hours). | 4.264 | 3.747 | 1.083 | 18.833 |
| WMRU | Wanganui registered unemployed (monthly), including vacation workers | INFOS Time Series (UMPM.S91L), Statistics New Zealand | 1925.191 | 1622.365 | 32 | 5016 |
| TARA | Annual match vs Taranaki | WRFU Annual Reports | 0.139 | 0.347 | 0 | 1 |
| INT_T1 | International opposition (country) | WRFU Annual Reports | 0.046 | 0.211 | 0 | 1 |
| PRENPC | Prior to NPC establishment | | 0.175 | 0.381 | 0 | 1 |
| NPC1 | First NPC format | (Garland 1997) | 0.381 | 0.487 | 0 | 1 |
| NPC2 | Second NPC format | (Garland 1997) | 0.052 | 0.222 | 0 | 1 |
| NPC3 | Third NPC format | (Garland 1997) | 0.253 | 0.436 | 0 | 1 |
| NPC4 | Fourth NPC format | (Garland 1997) | 0.139 | 0.347 | 0 | 1 |
| DIV2NI | Div. 2 NPC (North Island) games | WRFU Annual Reports | 0.160 | 0.367 | 0 | 1 |
| DIV2 | Div. 2 NPC games | WRFU Annual Reports | 0.088 | 0.283 | 0 | 1 |
| DIV3 | Div. 3 NPC games | WRFU Annual Reports | 0.093 | 0.291 | 0 | 1 |
| DIV3SF | Div. 3 semi-final | WRFU Annual Reports | 0.010 | 0.101 | 0 | 1 |
| DIV3F | Div. 3 final | WRFU Annual Reports | 0.005 | 0.072 | 0 | 1 |
| PROMPY | Promotion to Div.2 in previous year | (Knight, 2001) | 0.036 | 0.187 | 0 | 1 |
| RELPY | Relegated to Div.3 in previous year | (Knight 2001) | 0.072 | 0.259 | 0 | 1 |
| SKY | Sky television available | | 0.227 | 0.420 | 0 | 1 |
| MWK | Game played on a weekday (Monday-Friday) | WRFU Annual Reports | 0.490 | 0.501 | 0 | 1 |

[4] *REAL_PRICE* is adjusted to real values using CPI data from the Reserve Bank of New Zealand's website (www.rbnz.govt.nz) with a base year of 1999.

Jones, et al. (2000) emphasised the need for diagnostic testing of econometric models used in demand studies, especially given the time series nature of data used in many studies. A key assumption made by many researchers to validate the use of ordinary least squares regression techniques using time series data is the assumption that the time series data are stationary – that is, the mean and variance are constant over time, and the covariance between two values in the series depends only upon the length of time separating the values (Hill, Griffiths, and Judge, 2000). One must be careful to ensure that data are stationary, as there is potential for a regression between two non-stationary variables to produce spurious results. This model utilises several time-series variables, and as such, it is appropriate here to test the stationarity properties of these variables. The tests adopted in this study are Augmented Dickey-Fuller unit root tests, and the results are as shown in Table 2.

**Table 2: Unit Root Tests of Time-Series Variables**

| Variable | $H_0$: Constant, Trend Test Statistic | p-value |
|---|---|---|
| ATT | -13.567 | 0.000 |
| REAL_PRICE | -4.800 | 0.001 |
| DIST_HRS | -11.456 | 0.000 |
| WMRU | -2.300 | 0.432 |
| D_WMRU | -12.968 | 0.000 |

Note: p-values reported are MacKinnon one-sided values (MacKinnon, 1996).

The results of the unit root tests indicate that the null hypothesis of a unit root can be rejected for *ATT*, *REAL_PRICE* and *DIST_HRS*. For *WMRU*, however, there was insufficient evidence to reject the null hypothesis of a unit root. As a result, *WMRU* was re-specified in first differences (*D_WMRU*), and the resulting tests indicated that the presence of a unit root was rejected, and thus the first-differenced variable rather than the level variable is utilised in the preceding estimated models. It is worthwhile mentioning here that there are issues with the nature of the time series in not only this study but in many similar studies of attendance, in that the spacing between games is not regular. For instance, the time between games may be a week, a month or even six months between the end of one season and the beginning of the next season. For this reason, one must tread cautiously with the use of standard tests which assume evenly-spaced time intervals between observations. This study utilises standard tests, but recognises the limitations of their use in this type of analysis.

Following the selection of variables is the model selection process. Four functional forms of equation 2 are estimated, namely the linear, lin-log, semi-log (log-lin) and double log (log-log) specifications. In the linear specification all variables are in their original form. In the lin-log specification, attendance and lagged attendance are linear, while real price, distance, and change in unemployment are all in natural log form. The semi-log specification has logged attendance, while the other non-dummy independent variables are in their linear forms, and the double log specification has the attendance, lagged attendance, real price, distance and change in unemployment variables in their natural log form.

## 6. RESULTS

Initial estimation of each functional form of the model in equation 2 across the full sample of 193 observations revealed a coefficient result that was contrary to expectations.[5] The price coefficient was found to be positive but insignificant. Some studies within the literature have found a similar positive (but significant) effect for rugby league in the UK (Baimbridge, Cameron, and Dawson, 1995, 1996). Closer inspection of the data set revealed that international-level and "other domestic" games had higher real ticket prices and also substantially higher attendances than regular domestic games in many cases. The sample was thus adjusted to omit matches against international opposition and "other domestic" opposition (which included games against New Zealand Maori and New Zealand Colts, among others) resulting in an adjusted sample size of 169 observations. The yearly time trend was also removed from the model as there are multicollinearity issues with the PRENPC and NPC format dummy variables. The subsequent estimation of each of the functional forms of equation 2 using the adjusted sample produced price coefficients that were negative and significant, and thus consistent with a-priori expectations. Each model was initially tested for heteroskedasticity (White's test) and this was found to be present in all models. The estimated coefficients are thus based on OLS estimation of each functional form using White's heteroskedasticity-consistent covariance matrix. The results of these models are presented in Table 3.

Initial estimation of these models indicated that the errors of the estimation were non-normal as determined by Jarque-Bera normality tests. These models were thus re-estimated with dummy variables included to factor outliers "out" of model estimation (Brooks, 2008)[6]. The results presented in Table 3 include the dummy variables as estimated for each model. The coefficients for the variables of interest (and the subsequent consumer surplus calculations) did not differ greatly from results obtained with non-normal errors.

[5] Including 193 observations in the sample size meant that lagged attendance in the first game of each season (with the exception of the first game in the sample) was the attendance in the last game of the previous year. Removal of the first game in each year will limit the number of games against Taranaki in the data set, as the Queen's Birthday game was usually the season opener. If the team had a good year, or a bad year, the attendance at the last game of the season could well reflect possible attitudes towards the team in the first game of the following season. Although this effect is captured somewhat by the promotion and relegation variables, they are not the same effects.

[6] Residual plots for model estimations were examined to identify outliers. The largest outlier was factored out via a dummy variable, and then non-normality tests were re-run. Further outliers were identified and dummy variables included until satisfactory results for normality tests were obtained (that is, that the null hypothesis of normality was not rejected). Parameter estimates for the necessary dummies for each model are included in Table 3.

**Table 3: Model Estimation: Attendance**

| | Model 1 (Linear): Dependent Variable: ATT Method: Least Squares Included observations: 169 after adjustments (White Heteroskedasticity-Consistent Standard Errors & Covariance) | | Model 2 (Lin-Log): Dependent Variable: ATT Method: Least Squares Included observations: 169 after adjustments (White Heteroskedasticity-Consistent Standard Errors & Covariance) | | Model 3 (Semi-Log): Dependent Variable: LOG_ATT Method: Least Squares Included observations: 169 after adjustments (White Heteroskedasticity-Consistent Standard Errors & Covariance) | | Model 4 (Log-Log): Dependent Variable: LOG_ATT Method: Least Squares Included observations: 169 after adjustments (White Heteroskedasticity-Consistent Standard Errors & Covariance) | |
|---|---|---|---|---|---|---|---|---|
| **Variable** | **Coefficient** | **p-value** | **Coefficient** | **p-value** | **Coefficient** | **p-value** | **Coefficient** | **p-value** |
| C | 2359.232 | 0.000 | 3209.482 | 0.000 | 7.077 | 0.000 | 7.646 | 0.000 |
| ATT(-1) | -0.007 | 0.746 | -0.008 | 0.689 | - | - | - | - |
| LOG_ATT(-1) | - | - | - | - | 0.050 | 0.272 | 0.048 | 0.306 |
| REAL_PRICE | -143.693 | 0.016 | - | - | -0.089 | 0.079 | - | - |
| LOG_REAL_PRICE | - | - | -879.703 | 0.012 | - | - | -0.540 | 0.079 |
| DIST_HRS | -39.293 | 0.005 | - | - | -0.048 | 0.001 | - | - |
| LOG_DIST_HRS | - | - | -263.911 | 0.000 | - | - | -0.278 | 0.000 |
| D_WMRU | -0.019 | 0.953 | - | - | 0.000 | 0.689 | - | - |
| LD_WMRU | - | - | 45.933 | 0.831 | - | - | -0.037 | 0.806 |
| TARA | 2274.950 | 0.000 | 2253.618 | 0.000 | 1.258 | 0.000 | 1.246 | 0.000 |
| PRENPC | 124.931 | 0.528 | 59.853 | 0.771 | 0.472 | 0.026 | 0.428 | 0.058 |
| NPC1 | 819.406 | 0.000 | 777.581 | 0.000 | 0.744 | 0.000 | 0.713 | 0.000 |
| NPC3 | -190.465 | 0.187 | -238.353 | 0.098 | 0.096 | 0.609 | 0.060 | 0.761 |
| NPC4 | -708.463 | 0.012 | -742.101 | 0.009 | -0.330 | 0.301 | -0.352 | 0.287 |
| DIV2NI | -869.880 | 0.000 | -827.059 | 0.000 | -0.630 | 0.000 | -0.584 | 0.000 |
| DIV2 | 254.832 | 0.099 | 268.475 | 0.081 | 0.017 | 0.923 | 0.017 | 0.924 |
| DIV3 | 653.971 | 0.000 | 743.757 | 0.000 | 0.425 | 0.008 | 0.499 | 0.001 |
| DIV3SF | 1481.390 | 0.000 | 1600.660 | 0.000 | 1.573 | 0.000 | 1.659 | 0.000 |
| DIV3F | 3333.122 | 0.000 | 3272.162 | 0.000 | 2.545 | 0.000 | 2.497 | 0.000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PROMPY | 97.657 | 0.553 | 154.744 | 0.377 | 0.394 | 0.041 | 0.445 | 0.028 |
| RELPY | -271.427 | 0.085 | -282.220 | 0.054 | -0.098 | 0.454 | -0.108 | 0.376 |
| SKY | -231.252 | 0.186 | -271.565 | 0.128 | -0.385 | 0.071 | -0.414 | 0.059 |
| GAME | -91.819 | 0.000 | -88.725 | 0.000 | -0.063 | 0.004 | -0.063 | 0.006 |
| MWK | -145.744 | 0.151 | -104.870 | 0.290 | 0.009 | 0.925 | 0.041 | 0.646 |
| D2 | 3728.369 | 0.000 | 3634.638 | 0.000 | - | - | - | - |
| D12 | 2781.982 | 0.000 | 2749.573 | 0.000 | - | - | - | - |
| D17 | 1841.836 | 0.000 | 1763.827 | 0.000 | - | - | - | - |
| D25 | 2581.937 | 0.000 | 2575.164 | 0.000 | - | - | - | - |
| D37 | 2283.361 | 0.000 | 2248.686 | 0.000 | - | - | - | - |
| D52 | 2554.748 | 0.000 | 2408.552 | 0.000 | - | - | - | - |
| D76 | 2166.717 | 0.000 | 2233.545 | 0.000 | 1.569 | 0.000 | 1.639 | 0.000 |
| D78 | - | - | - | - | -2.210 | 0.000 | -2.094 | 0.000 |
| D118 | -1918.357 | 0.000 | -1954.701 | 0.000 | - | - | - | - |
| D134 | -2147.103 | 0.000 | -2141.853 | 0.000 | - | - | - | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | R-squared | 0.898 | R-squared | 0.902 | R-squared | 0.851 | R-squared | 0.864 |
| | Adjusted R-squared | 0.877 | Adjusted R-squared | 0.882 | Adjusted R-squared | 0.851 | Adjusted R-squared | 0.864 |
| | Log likelihood | -1275.095 | Log likelihood | -1271.837 | Log likelihood | -1306.948 | Log likelihood | -1299.489 |
| | Mean dependent var | 1350.237 | Mean dependent var | 1350.237 | Mean dependent var | 6.801 | Mean dependent var | 6.801 |
| | S.D. dependent var | 1435.214 | S.D. dependent var | 1435.214 | S.D. dependent var | 0.924 | S.D. dependent var | 0.924 |
| | Akaike info criterion | 15.433 | Akaike info criterion | 15.395 | Akaike info criterion | 15.479 | Akaike info criterion | 15.390 |
| | Schwarz criterion | 15.970 | Schwarz criterion | 15.932 | Schwarz criterion | 15.497 | Schwarz criterion | 15.409 |
| | F-statistic | 43.893 | F-statistic | 45.815 | F-statistic | 23.404 | F-statistic | 24.100 |
| | Prob(F- | 0.000 | Prob(F- | 0.000 | Prob(F- | 0.000 | Prob(F- | 0.000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | statistic) | | statistic) | | statistic) | | statistic) | |
| | Breusch-Godfrey LM test (F) | 1.205 | Breusch-Godfrey LM test (F) | 1.112 | Breusch-Godfrey LM test (F) | 0.415 | Breusch-Godfrey LM test (F) | 0.763 |
| | p-value | 0.274 | p-value | 0.293 | p-value | 0.813 | p-value | 0.384 |

| **Test** | **Test statistic** | **P-value** | **Test statistic** | **P-value** | **Test statistic** | **P-value** | **Test statistic** | **P-value** |
|---|---|---|---|---|---|---|---|---|
| Jarque-Bera Test (Normality) | 3.303 | 0.192 | 3.768 | 0.152 | 0.907 | 0.343 | 0.706 | 0.703 |
| Ramsey RESET Test (1) (F) | 77.379 | 0.000 | 85.091 | 0.000 | 1.115 | 0.293 | 1.233 | 0.269 |
| Ramsey RESET Test (2) (F) | 43.743 | 0.000 | 48.233 | 0.000 | 1.732 | 0.180 | 1.754 | 0.177 |
| Ramsey RESET Test (3) (F) | 29.073 | 0.000 | 32.050 | 0.000 | 1.272 | 0.286 | 1.224 | 0.303 |

The clear consensus from the recreational demand literature is that the appropriate functional form of the demand equation must be chosen carefully. Not only should the "best" model conform to economic theory, but it should be superior in as many aspects as possible to alternative functional forms. Kling (1989) advocated the use of goodness-of-fit tests to select the appropriate functional form to generate more reliable measures of consumer surplus. Adamowicz, et al. (1989) suggested that the selection of the appropriate model should be based on the F-statistic and the level of significance of the travel cost (price) coefficient. A more recent suggestion was that model selection be based on empirical tests including the log-likelihood and Schwartz and Akaike criterion values (Lansdell and Gangadharan, 2003).

Models 1 and 2 have a linear dependent variable, while Models 3 and 4 have a logged dependent variable, which means that the R-squared, Schwartz and Akaike criterion test statistics for Models 3 and 4 need to be adjusted to make them comparable with the test statistics for Models 1 and 2. This is achieved by following the method utilised by Lansdell and Gangadharan (2003), where the fitted values of logged attendance were estimated, the antilog values of estimated logged attendance were calculated, and then the antilog estimated attendance was regressed against attendance. The resulting R-squared, Schwartz and Akaike test statistics will be consistent with those calculated in Models 1 and 2, and thus are reported in Table 3.

Diagnostic test results in Table 3 were scrutinised to determine the preferred model. The adjusted R-squared and the log-likelihood value results favour Model 2, while the Akaike and Schwartz information criteria favour Model 3. Jarque-Bera tests for normality favour Model 4, while Ramsey RESET tests, however, favour Model 3 and 4 over Models 1 and 2.

It is worth briefly commenting on the nature of the coefficient signs across each of the functional forms. Lagged attendance was positive and significant in Models 3 and 4, indicating habit persistence, but statistically insignificant in Models 1 and 2. The real price coefficient was negative and significant in all models. It should be noted that the p-values for the price coefficient are 0.016 and 0.012 for the linear and lin-log models respectively, while the corresponding p-values for the semi-log and log-log models are both 0.079. The estimated price elasticities of attendance for each model are as shown below in Table 4.

**Table 4: Estimated Price Elasticities of Demand[7]**

| | **Model 1 (Linear)** | **Model 2 (Lin-Log)** | **Model 3 (Semi-Log)** | **Model 4 (Log-Log)** |
|---|---|---|---|---|
| Price coefficient | -143.693<br>(0.016) | -879.703<br>(0.012) | -0.089<br>(0.079) | -0.540<br>(0.079) |
| Elasticity | -0.596 | -0.651 | -0.500 | -0.540 |

Note: p-values are reported in parentheses below the price coefficients.

[7] These elasticities were calculated at mean values of REAL_PRICE and ATT. The formulas used to calculate the elasticities were: $\beta$*(REAL_PRICE)/ATT* (linear); $\beta$*/ATT* (lin-log); $\beta$*(REAL_PRICE)* (semi-log); and $\beta$ (log-log).

Each of the functional forms produced an elasticity between –0.5 and -0.65. The signs, significance and elasticities (price-inelastic demand) are consistent with the findings of most studies of sporting attendance within the literature, including Australian-based studies for rugby league (Alchin and Tranby, 1995) and Australian rules football (Borland and Lye, 1992).

A negative and inelastic price coefficient indicates profit maximising behaviour, a well-established result within the literature (Fort, 2004). Such a result appears at first glance to be inconsistent with profit-maximising behaviour – one might reasonably expect ticket prices to be set on the elastic portion of the demand curve (Boyd and Boyd, 1998; Downward, Dawson, and Dejonghe, 2009). Explanations given in the literature for why such a result may not be inconsistent with profit-maximising behaviour include consideration of the home ground advantage effect alongside ticket prices (Boyd and Boyd, 1998), and other sources of revenue, including television revenue (Fort, 2004).

The distance coefficient was negative and significant at the 1% level or better in all four models, a result that is consistent with other sport attendance studies that have explicitly included and examined the distance effect (Baimbridge, et al., 1995, 1996; Carmichael, Millington, and Simmons, 1999). The inclusion of a measure of distance can also be interpreted as further evidence of a price effect in the sense that there are costs incurred with travel to and from the games. The change in unemployment coefficient was insignificant for all four models.

The coefficient for the annual Queen's Birthday fixture with Taranaki was unsurprisingly found to be positive and significant (p-values < 0.000) for all four models. As mentioned earlier, games prior to the introduction of the NPC were 'friendlies' in nature. The *PRENPC* coefficient was positive and significant for Models 3 and 4 (p-values ≤ 0.058), but insignificant in Models 1 and 2. The *NPC1* coefficients were all greater than the *PRENPC* coefficients and also statistically significant in all four models (p-values = 0.000), suggesting that the introduction of the NPC had the desired effect of increasing attendances. *NPC3* was only significant (and negative) in Model 2 (p-value = 0.098), while *NPC4* was negative and significant in Model 1 (p-value = 0.012) and Model 2 (p-value = 0.009), but insignificant in Models 3 and 4. These results provide some evidence that the introduction of the NPC had positive impacts on match attendance, but also that these impacts were transitory in nature. Bearing in mind that the *PRENPC*. *NPC1*, *NPC3* and *NPC4* dummy variables effectively encompass the sample period, these can also be interpreted as reflecting the observed decline in overall attendance over time.

As far as the competition matches played within each division are concerned, the *DIV2NI* coefficient was negative and significant in all four models (p-values = 0.000), *DIV2* was significant and positive for Models 1 (p-value = 0.099) and 2 (p-value = 0.081) but insignificant for Models 3 and 4. The *DIV3* coefficient was positive and significant and greater than the DIV2 coefficients for all four models (p-values ≤ 0.008). This relationship is surprising when one might reasonably expect there to be a greater attendance effect associated with the higher standard of rugby. The smaller effect for *DIV2* could well be due to Wanganui's competitiveness in the second division. As a second division union during the sample period, Wanganui had a

home win percentage that was just above 50%. As a third division union, Wanganui's home win percentage was 89%. Rather than a positive relationship between standard of rugby and attendance, it appears that fans attended in greater numbers to see games in which Wanganui had a better chance of winning, that is, in Division Three. Such a result has interesting ramifications for the "uncertainty of outcome" hypothesis. A positive relationship between likelihood of winning and attendance is supported by the evidence in this paper for Wanganui.

Both the Division 3 semi-final and final coefficients were found to be positive and significant in all four models (p-values $\leq$ 0.000). When Wanganui won promotion to Division Two in the previous year, the coefficient was positive and significant in Model 3 (p-value = 0.041) and Model 4 (p-value = 0.028), but insignificant in Models 1 and 2. When Wanganui was relegated to Division Three, the coefficient was negative and significant in Model 1 (p-value = 0.085) and Model 2 (p-value = 0.054), but insignificant in Models 3 and 4.

The coefficient on the substitute variable, *SKY*, was negative for all four models but only significant for Models 3 (p-value = 0.071) and 4 (p-value = 0.059). The within-season *GAME* trend coefficient was significantly negative for all four models (p-values $\leq$ 0.006), indicating that attendance fell the further the season went on. The effect on attendance for a game staged midweek was not significant for any of the four models.

It is pertinent at this juncture to examine potential linkages between this study and both of the Owen and Weatherston (2004) studies. Key similarities include the findings that tradition (annual fixtures) and habit (lagged attendances) were important determinants of attendance. While there is no question that professionalism has had dramatic impacts on rugby attendance in New Zealand post-1994, the importance of tradition and habit, as well as uncontrollable factors such as rainfall[8] and team performances in determining attendance, suggest that administrators faced at least some similar challenges in both the amateur and professional eras.

A natural question at this point is how these findings are relevant for the role of local government in the facility construction issue that motivates this analysis. It is important to note the consistent findings of price-inelastic demand, the negative distance impact, the popularity of the annual fixture against Taranaki, and the impacts of certain divisional games. Each of these factors will influence demand and therefore the values of consumer surplus. It is to the calculation of these values that this analysis now turns.

[8] Weather details for each game were not available for inclusion in this analysis at the time of model estimation.

## 7. MEASUREMENT OF CONSUMER SURPLUS AS ECONOMIC BENEFITS

Consumer surplus estimates provide measures of user benefits from attending representative rugby in Wanganui. For each of the estimated models, we can derive consumer surplus values. Previous research within the analysis of recreational demand has demonstrated that the measurement of consumer surplus is sensitive to the functional form of the demand equation (Kling, 1989; Ziemer, Musser, and Hill, 1980), as well as the absolute size of the price parameter (Adamowicz, Fletcher, and Graham-Tomasi, 1989; Graham-Tomasi, Adamowicz, and Fletcher, 1990) and omitted variables (Bockstael and Strand, 1987). Indeed, Ziemer, et al. (1980) found that the consumer surplus value estimated from a linear demand function was four times the surplus value of a quadratic demand function and almost three times that of a semi-log demand function.

Consumer surplus can be calculated from each of the estimated models. The formulas used for these calculations were taken from Adamowicz, et al. (1989) and are as shown in equations 3 to 7 below.

Linear:

$$CS_{linear} = \frac{ATT^2}{-2\alpha_1} \tag{3}$$

Lin-Log:

$$CS_{lin-\log} = \max(REAL\_PRICE) \times (\max(ATT) - \alpha_1) - (REAL\_PRICE \times (ATT - \alpha_1)) \tag{4}$$

Semi-Log:

$$CS_{semi-\log} = \frac{ATT}{-\alpha_1} \tag{5}$$

Log-Log:

$$CS_{\log-\log} = \frac{1}{\alpha_1 + 1} \times [(\max(REAL\_PRICE) \times (\max(ATT)) - (REAL\_PRICE \times ATT)] \quad (\text{if } \alpha_1 > -1) \tag{6}$$

$$CS_{\log-\log} = \frac{-(REAL\_PRICE \times ATT)}{\alpha_1 + 1} \quad (\text{if } \alpha_1 < -1) \tag{7}$$

where $\alpha_1$ is the *REAL_PRICE* coefficient.

For the linear and semi-log calculations, mean attendance for the season in question was used to calculate per game consumer surplus. For the lin-log and log-log calculations, the maximum

price and attendance as well as the average real price and attendance per game in the season in question are used to arrive at per game estimates of consumer surplus. These per game measures were multiplied by the number of games to give a total consumer surplus value per season in 1999 dollars in Table 5.

**Table 5: Estimates of Consumer Surplus Benefits Generated by Wanganui Representative Rugby (in 1999 dollars)**

| Season | Model 1 (Linear) ($) | Model 2 (Lin-Log) ($) | Model 3 (Semi-Log) ($) | Model 4 (Log-Log) ($) |
|---|---|---|---|---|
| 1991 (per game) | 8,779.18 | 12,443.83 | 8,899.20 | 24,409.22 |
| (season) | 87,791.84 | 124,438.30 | 88,991.98 | 244,092.20 |
| 1992 (per game) | 9,881.83 | 4,347.01 | 9,442.28 | 8,390.43 |
| (season) | 59,290.97 | 26,082.05 | 56,653.69 | 50,342.58 |
| 1993 (per game) | 11,231.49 | 14,913.22 | 10,065.66 | 30,250.14 |
| (season) | 123,546.30 | 164,045.40 | 110,722.30 | 332,751.50 |
| 1994 (per game) | 3,877.63 | 8,522.21 | 5,914.35 | 14,325.12 |
| (season) | 42,653.90 | 93,744.28 | 65,057.82 | 157,576.30 |
| Per game average | 8,442.53 | 10,056.57 | 8,580.37 | 19,343.73 |
| Per season average | 78,320.76 | 102,077.50 | 80,356.44 | 196,190.60 |
| Per spectator average | 11.03 | 13.13 | 11.21 | 25.26 |

Consumer surplus values for the four most recent seasons of attendance in the sample are presented in Table 5 – the 1991, 1992, 1993 and 1994 seasons – and the average per game, per season and per spectator estimates. Consumer surplus estimates from all four models are presented by way of comparison. The log-log model generates the greatest value of consumer surplus of the four models on average, at almost twice the nearest measure, while the linear model generates the lowest consumer surplus values. The overall average per game consumer surplus across the four models is $11,605.80; the average season consumer surplus is $114,236.30; while the per-spectator average is $15.16. This suggests that each spectator at Wanganui matches between 1991 and 1994 received approximately $15 in consumer surplus benefits on average for each match attended. Extrapolation of this estimate suggests that the Division Three final hosted in Wanganui in the 1993 season generated in excess of $38,000 in consumer surplus benefits to local attendees. By way of comparison, one recent study found that golfers in Colorado (United States) enjoyed consumer surplus of US$18.44 for a round of golf (Loomis et al., 2009), while another study found median per-visit willingness to pay values for the Whakarewarewa Forest in Rotorua, New Zealand, of $81 for walkers and $120 for mountain-bikers (Turner, Dhakal, Yao, Barnard, and Maunder, 2011) .

Average consumer surplus values across the four models are used for the remainder of the analysis. Although the attendance per game is trending downwards across the sample (as indicated by the PRENPC, NPC1, NPC3 and NPC4 coefficients in each of the models), the consumer surplus values have fluctuated within these seasons, and hence the average for the last four years of the sample might be considered a smoothed approximation of consumer surplus beyond 1994. Previous research into the honeymoon effect of new stadia suggests that increases in attendance levels experienced as a result of a new facility are transitory and will eventually return to attendance levels experienced before the new facility (Baade and Sanderson, 1997; Clapp and Hakes, 2005; Coates and Humphreys, 2005; Leadley and Zygmont, 2005). The average consumer surplus for the 1991-1994 seasons can thus be considered as a conservative approximation of these benefits.

Caution is advised when interpreting consumer surplus values. The presence (and effectiveness) of alternative pricing mechanisms, including price discrimination and two-part tariff pricing, among others, effectively limits the suitability of consumer surplus to justify public involvement on efficiency grounds (Groothuis, et al., 2004). Successful pricing arrangements typically result in spectators paying prices closer to their reservation price, thereby lowering consumer surplus.[9] Because the models include a component of travel cost that is not part of the calculation of the consumer surplus benefits (although the presence of distance in the model has influenced the real price coefficient), the estimated values further understate the true consumer surplus values.

Because the figures above are based on aggregate attendance, they overstate the true consumer surplus benefits to the city of Wanganui to the extent that aggregate attendance includes both local and non-local attendees. Non-locals should thus be removed from an analysis that intends to produce results of relevance to local government, as it is local and not aggregate consumer surplus benefits that should be considered by local government. Non-local attendees at major league professional sports events in the United States have been estimated as being between 5 to 20% of total attendance (Siegfried and Zimbalist, 2002). For the remainder of this analysis, it is assumed that 10% of all attendees are non-local, a figure utilised by at least one economic impact study of rugby (Venture Taranaki, 2004).

Average consumer surplus per season across all four models accruing locally was therefore approximately $102,812 in 1999 dollars.[10] To put this value in perspective, the Wanganui District Council, in 2005, funded the entire Cooks Gardens complex to the tune of approximately $200,000 annually, of which the Stadium is one part (Cooks board fights back, 2005). In 2009, the Council's operating costs for Cooks Gardens were $274,000 (Wanganui District Council, 2009), or approximately $213,000 in 1999 dollars. The Council has noted that the major ground users (athletics, rugby and cycling) met the marginal costs of their events but made no

[9] Unfortunately, season ticket information for Wanganui rugby was only available at an aggregate season level, and thus was not able to be incorporated as a part of the game-by-game analysis adopted in this study. Attendances in this study were for walk-up paid attendance, and did not include season ticket holders. To this end, the calculated consumer surplus value effectively understates true consumer surplus.

[10] $102,812 = $114,236 x 0.9.

contribution to maintenance costs (Wanganui District Council, 2009). Rugby's average consumer surplus values alone do not justify $213,000 per year in local government funding; although the average of log-log estimates of consumer surplus from 1991 to 1994 from Model 4 suggest that it may possibly come close. Adding the consumer surplus benefits generated by other events hosted at the facility, including athletics, cycling and concerts, among others to the consumer surplus generated by rugby in Wanganui would provide a more complete value of the consumption benefits of the facility to locals.

The main northern stand at Cooks Gardens was built at a cost of $1.2 million in 1996 (Cooks board fights back, 2005), of which $260,000 ($264,000 in 1999 dollars) was loaned to the Cooks Gardens Trust Board by the Wanganui District Council (Wanganui District Council, 2009). Converting the average consumer surplus values into a present value can also provide useful information to assist future government funding decisions. Such decisions should be based on cost-benefit comparisons rather than solely on economic impact considerations. The consumer surplus estimates generated within this analysis can be considered as estimates of annual benefits to users of the facility. In the absence of non-use benefits accruing to local residents, these consumer surplus estimates can thus be directly compared to project costs to assess the economic viability of local government funding. The estimated net present values presented below in Table 6 below are based on the four year average values of consumer surplus across all four models.

**Table 6: Present Values of Consumer Surplus Benefits Generated by Wanganui Representative Rugby (Average Season Estimates, in 1999 dollars)**

| | **Time (years)** | |
|---|---|---|
| **Discount Rate (%)** | **20** | **30** |
| 2 | $1,681,129 | $2,302,642 |
| 4 | 1,397,254 | 1,777,835 |
| 6 | 1,179,250 | 1,415,174 |
| 10 | 875,305 | 969,204 |
| 15 | 643,535 | 675,067 |
| 20 | 500,656 | 511,894 |

The net present value of consumption benefits generated by representative rugby to Wanganui spectators is dependent upon the discount rate and the length of time that the annual benefits are expected to be generated. Assuming a discount rate of 10% and a time period of 20 years, the present value of average consumer surplus is approximately $875,000 in 1999 dollars, and for 30 years is approximately $969,000. In the absence of non-use values, these values represent the maximum amounts that local government could justifiably contribute to a rugby-only facility on consumer surplus grounds.

As mentioned earlier, this value is effectively a lower limit and is likely to understate the true value of private benefits of rugby in Wanganui. Many locals are likely to incur travel costs to

some extent, and this is not factored into these calculations. Local attendees may have also received non-use benefits. No attempt is made in this study to estimate non-use benefits, and it would be difficult to approximate these benefits given the limited research on these types of benefits in similar contexts to date.

Nevertheless, it is interesting to note that the present value of the estimated consumer surplus benefits for Wanganui rugby in 1994 (20 years, at a discount rate of 10%) was approximately 73% of the total construction value of the Northern stand, and over 3.3 times greater than the District Council's contribution to the facility upgrade. Thus, even in the absence information on the non-use (public good) benefits, producer surplus benefits (economic impacts) or consumer surplus benefits from other activities at Cooks Gardens, the Council's contribution towards the construction of the stand would appear to be justified.[11]

The general limitations of consumer surplus and its calculation in this analysis notwithstanding, the calculation of consumer surplus in this research provides the basis for economically justifiable grounds upon which to base the Council's funding decision for the Cooks Gardens facility in Wanganui. Representative rugby is one of a multitude of users of the Cooks Gardens facility. It would not be unreasonable to assume that other events such as athletics and concerts would also generate consumer surplus benefits to local residents that should also be included in the evaluation of a multiple-purpose facility such as Cooks Gardens. The sum total of consumer surplus benefits could potentially justify considerable local government involvement in the funding of the multiple-purpose Cooks Gardens facility in this analysis.

The full extent of local government involvement in the financing of sports facilities should depend on the outcome of a complete benefit-cost analysis which would ideally include all use and non-use values of the facility. Given that such studies are often expensive to conduct, a cheaper alternative would be an analysis that at the very least includes estimates of consumer surplus benefits. The inclusion of consumer surplus benefits from a facility or event and recognition of the potential shortcomings of their measurement in addition to an accurate economic impact analysis will, in this author's opinion, provide greater economic justification for local government involvement than an economic impact analysis alone.

[11] In an epilogue to this story, the $260,000 loan was written off by the Wanganui District Council in 2009 (Maslin, 2009). On the basis of the present value estimates of consumer surplus for rugby derived in this analysis, writing off the loan was economically justified.

## 8. CONCLUSIONS

This analysis developed a model of attendance that encapsulated economic variables, consumer preferences and characteristics of the sporting contest for representative rugby in Wanganui. Several alternative model specifications were estimated, and the results of model specification tests suggested that the log-log model was the most suitable functional form.

Significant findings from the model estimation included price-inelastic demand, the popularity of the annual fixtures with Taranaki, and the impact of the introduction of the National Provincial Championship. Initial NPC games were popular with spectators. Over time, however, NPC games in Wanganui became less popular. Attendance was greater at lower level (Division Three) games than for higher level (Division Two) games, suggesting that people preferred to watch games in which the home team had a better chance of winning rather than the prospect of a more even contest.

The primary motivation for this analysis was to consider the consumer surplus benefits generated by representative rugby in Wanganui and to determine whether or not the Wanganui District Council's involvement in the upgrade of the Cooks Gardens facility was economically justifiable. Estimates suggested that average consumer surplus accruing to Wanganui locals between 1991 and 1994 was approximately $102,000. The average consumer surplus value was converted into a present value (assuming a 10% discount rate and 20 years of annual consumer surplus benefits) to give a present value of the consumer surplus benefits of representative rugby in Wanganui of approximately $875,000. This value suggested the extent to which local government could be economically justified in funding a facility to house representative rugby in Wanganui, given the absence of non-use benefits. As such, these values effectively understated the true value of rugby to Wanganui. In the absence of spillover economic benefits such as public goods generated from events hosted at the stadium and the presence of the stadium itself, the decision of the Wanganui District Council to extend (and subsequently write off) a $260,000 loan towards the construction of the main northern stand at the Cooks Gardens facility was economically justified.

Similar research could be undertaken for other provincial unions in New Zealand to ascertain the role that local government could play in future stadium upgrades and construction. The measurement of consumer surplus is an important and necessary step in providing economic justification for the involvement of local government in sports facility projects. Of equal importance is the measurement of the value of spillover benefits and costs generated by sports events and sports facilities. Combining these benefits will go a long way towards justifying an appropriate level of government involvement in financing sports facilities. While recognising the limitations of consumer surplus as a measure of benefit both in this paper and in general, careful consideration of consumer surplus benefits should, at the very least, be a fundamental aspect of any facility or event evaluation if local government assistance is sought.

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