What Drives Television Demand for NPC Rugby Matches?

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Summary

In November 2005 the NZRU applied to the Commerce Commission for authorisation of certain arrangements that may be prohibited under the Commerce Act (1986). The authorisation procedures under s 61(1) of the Act require the Commission to identify any detriments likely to flow from a lessening of competition resulting from the proposed arrangements, and to balance those against any public benefits identified as likely to flow from the proposed arrangements. A key claim made by the NZRU in support of its application is that the proposed arrangements would facilitate closer on-field contests between unions, and that fans of NPC rugby derive benefit (greater enjoyment) from uncertainty of outcome. If this claim proves true, the bulk of public benefits would flow to television viewers as they represent the largest group of consumers of NPC matches. This note aims to investigate empirically whether uncertainty of outcome matters to television viewers of 1st Division NPC matches. Another important issue is whether the quality of contest, which may also be affected by the proposed arrangements, influences audience demand? The approach taken in this study is to estimate a demand equation for televised NPC matches, which is specified as a function of outcome uncertainty and contest quality, as well as a number of other control variables. The key findings are that none of the uncertainty of outcome measures used were statistically significant in explaining the variation in television demand for NPC matches, suggesting that the uncertainty of outcome hypothesis does not hold with respect to television viewers of 1st Division NPC matches. However, quality of play is apparently an important driver of audienceship. The results of this study imply that the benefits claimed to flow to television viewers from greater uncertainty of outcome, as a result of implementing the proposed arrangements, are unlikely to materialise. However, player redistribution policies that alter the quality of contests may be desirable from the perspective of viewer demand.

A Problem Definition

On 9 November 2005, the New Zealand Rugby Football Union Inc (NZRU) applied to the Commerce Commission (the Commission) under s 58 of the Commerce Act 1986 (the Act) to enter into certain arrangements of the kind prohibited by ss 27 and 29 of the Act. These included the introduction of a total player payroll cap for NPC Premier Division (PD) provincial unions, and the relaxation of current transfer regulations.

A key argument advanced by the NZRU in support of its application is that the proposed arrangements would lead to a more even distribution of talent across the PD, greater competitive balance and uncertainty of outcome in the competition, and therefore, more enjoyment of the game for the public of New Zealand. The proposition that greater uncertainty of outcome leads to enhanced spectator enjoyment has become known as the *uncertainty of outcome hypothesis* (UOH) in the economics literature.

Over the years, much research effort has been committed to empirically testing the UOH in relation to live attendance at sporting events.[1] However, little has been done to examine the importance of uncertainty of outcome to another category of spectators—television viewers. To the Commission's best knowledge, the very recent work by Forrest et al (2005) is the first published study that examines the link between uncertainty of outcome and television demand for team sports.[2] That study, which focussed on English Premier League Football, found that that uncertainty did matter to television audiences, but only weakly so ('improving' outcome uncertainty by one standard deviation, i.e., to not very far from complete equality in the prospects of the two teams in the particular match, raised predicted audience size by only 6.3%). To date, no empirical studies have investigated this question in relation to rugby union in New Zealand.

The fact that such little attention has been given to testing this aspect of the UOH is surprising for a number of reasons. First, in contemporary sports leagues, television audiences comprise a significantly greater element of demand than live match spectators. For example, in 2004 total attendance at NPC rugby matches represented approximately only 7% of total television viewership of NPC matches on SKY and TV3. Second, the UOH has been used to support numerous league restrictions that have faced scrutiny by the courts and antitrust agencies overseas. Given the apparent importance of television audiences as consumers of sports entertainment, one would have expected more empirical investigation of the nexus between uncertainty of outcome and television demand for sports in assessing league owners' claims. Third, television broadcasters face significant commercial incentives to understand the drivers of demand for the sports content they purchase from leagues. The role of the uncertainty of outcome of sporting contests is one obvious factor that seems to warrant investigation. Fourth, television audiences are less likely to be home-team biased than spectators at live matches. Therefore, examination of television demand for sport may more clearly reveal viewers' preferences for uncertainty of outcome, if any.

In its Draft Determination (9 March 2006), the Commission attributed the vast majority of the public benefits claimed to flow as a result of implementing the proposed arrangements to greater enjoyment of the game derived by television viewers. In doing so, it provisionally

[1] Szymanski (2003) and Fort (2006) provide useful surveys of overseas studies that empirically test the UOH. Owen and Weatherston (2004a; 2004b) examine the significance of uncertainty of outcome as a driver of attendance at ruby union (NPC and Super 12) matches in New Zealand.

[2] A number of articles have extended standard match demand studies to test the impact of television broadcasting on live match attendance. See Borland and MacDonald (2003) for a survey of these works. Hausman and Leonard (1997) and Kanazawa and Funk (2001) focus on the effect on television audience ratings of, respectively, a match featuring a 'superstar' and a match featuring a higher proportion of white players. Surprisingly, however, these studies do not include uncertainty of outcome measures.

accepted the NZRU's claim that television audiences find (at least to some extent) uncertainty of outcome desirable—a claim supported by two broadcasters (SKY and CanWest) in submissions. The Commission indicated at the time that it had to rely on such qualitative considerations given the lack of existing empirical evidence to the contrary, or sufficient viewership data with which the claim could be tested.

Since then, however, the Commission was able to obtain sufficient data to allow it to conduct its own econometric inquiry into whether the UOH is likely to hold for NPC rugby television audiences. The methodology and results of this investigation are presented here for interested parties to scrutinise and comment on. This note is structured as follows. Section B describes the data used in this study, and the specification of the model. The econometric results are reported in Section C. Section D provides some concluding remarks.

B Data and Model Specification

The theory of demand for sporting contests suggests that both quality of contest and uncertainty of contest outcome are important in attracting audiences (see, for example, Borland and Macdonald, 2003, p.479). To formalise this idea further, consider a league that consists of X distinct teams. Let e_j denote the quality (or 'effort') of team j. This variable is best thought of as the mean of a probability distribution of performance. In a competitive contest, the relative performance of the rival teams determines the outcome of the match. If two teams of equal quality meet, the probability of either team winning is 0.5, *ceteris paribus*. Suppose that $e_j < e_k$, then j has a lower probability of winning than k. The larger the inequality the smaller will be the probability that j will win.

Demand for a match between teams j and k from an individual consumer may depend on the quality of the contest, $(e_j + e_k)$, and on the closeness of the competition, $|e_j - e_k|$. A simple characterisation of this relationship is the following:

$$\begin{aligned} d_{jk} &= \frac{e_j + e_k}{2} - \frac{|e_j - e_k|}{2} \\ &= \min\{e_j, e_k\}. \qquad (1) \end{aligned}$$

This 'demand' function, which is increasing in the individual quality of both teams, and decreasing in the quality difference between the two opposing teams, is weakly maximal when team quality is equal.

The testing of the UOH in television to television viewership means to test whether the viewership increases when the probability of winning between the competing teams becomes more even, controlling for the quality of the two competing teams. In order to do this, the Commission estimated a $N \times T$ random effects panel model of viewer demand, where $N = 45$ round robin matches and $T =$ four years (2001:2004).

NPC matches in New Zealand are presently broadcast live on SKY and, until recently, with delay on TV3.[3] This study focuses on SKY viewership, but the availability of free-to-air coverage is used as a control variable to accommodate the possibility that some viewers may accept delayed coverage as an alternative to live coverage. The proxy for television demand for NPC rugby in this study are match-by-match television $RATING$s, defined as the percentage of the total New Zealand population over the age of five viewing a match. Ratings data were provided to the Commission by the NZRU.

In this study, it is hypothesised that demand for televised NPC matches is driven by five distinct factors. These include: consumer preferences, and in particular, the extent of $IDENT$ification with the teams involved in a sporting contest; EConomic factors, such as the cost of viewership; the availability of viewing SUBstitutes; the TIMing of broadcast matches (i.e., the day of the week on which the contest takes place, and the time of day); the $QUAL$ity of the sporting contest, which includes exhibition of the mental and physical quality of the teams involved; and $UNCERT$ainty of outcome.[4]

The panel model therefore has the following general functional form:

$$RATING_i = f(CONST, IDENT_i, EC_i, SUB_i, TIM_i, QUAL_i, UNCERT_i, \epsilon_i) \tag{2}$$

where i denotes match i; $CONST$ is a constant term; ϵ is a random error term; and $IDENT$, EC, SUB, TIM, $QUAL$ and $UNCERT$ are matrices containing explanatory variables, each of which are defined and discussed below:

$$\begin{aligned} IDENT &= (POP, PLAY, RELEG, RS); \\ EC &= (INC); \\ SUB &= (TV3, GAMES, CRICK, LEAG, UNION, TENNIS); \\ TIM &= (SAT, SUN, PM4, PM7, NOGAMES); \\ QUAL &= (SUPER, STAND, CBALW, HMWPS, AWWPS); \\ UNCERT &= (STDDIST, DHMWP, DHMWPS, DHMWPG). \end{aligned} \tag{3}$$

Whilst the New Zealand population represents the potential total market size for SKY coverage, it is viewers drawing from the two provinces competing in any given match who will likely have the most interest in the contest. The variable POP, which is the total population of the two competing provinces for each match i, is used to capture this effect. Annual regional population data was sourced from Statistics New Zealand.

For each union in each week a variable, $PLAY$, was constructed to capture how far it is from qualifying for the playoffs, in terms of championship points and league standings, and taking into account how many rounds are still left to play in the competition. The basic idea underlying

[3]In February 2006 SKY acquired Prime Television, and all NPC delayed coverage is now broadcast by Prime rather than TV3.

[4]Borland and Macdonald (2003) provide a comprehensive list of factors that may drive demand for live sporting contests. Many of the variables they suggest (such as match facilities, the availability of food outlets, etc.) do not sensibly apply to television audience demand for sport.

this measure is to calculate how many games each of the two competing unions is required to win or lose in order to catch up with, or drop below, the team in fourth position. A weighted average of this measure for the two competing teams, weighted by their standing difference from the fourth-placed union immediately before match i is played, was calculated to capture the importance of the game for qualifying for championship playoffs. A small value implies the two unions have a good chance of catching up or dropping below the team in fourth position in the coming game. It seems likely that more favourable prospects of making the playoffs would generate greater viewer interest, so this playoff variable is expected to be negatively related to demand for televised matches.

Similarly, a variable to capture the importance of the game for relegation playoff, $RELEG$ is calculated relative to the bottom-placed union in the current NPC standing. A low value implies that the two competing unions have a good chance of facing relegation, so once again a negative relationship between this relegation variable and match demand is hypothesised.

The Ranfurly Shield is one of the most prestigious trophies in New Zealand's domestic rugby union competition, and is competed for during the NPC through a challenges system. The winner of the shield in the previous season is obliged to accept at least seven challenges in the succeeding season, and all challenges occur during home game matches (except during knockout playoffs). It is generally thought that Ranfurly Shield challenges generate more fan interest than do non-challenge matches. To capture this possible effect a 'Log of Wood' dummy variable, RS, is specified. The variable takes a value of 1 if match i corresponds to a Ranfurly Shield challenge, and 0 otherwise.

SKY viewers typically incur subscription charges.[5] Household income is generally believed to have a positive impact on demand for pay-television subscription. In this analysis, the average household income of the population of the two competing provinces, INC, is used as a proxy for the ability of households within those provinces to pay SKY subscription charges. Weekly household income data was obtained from Statistics New Zealand.

As mentioned earlier, delayed coverage may represent a reasonable substitute for live coverage to some viewers. Hence, the availability of delayed coverage can be expected to have a negative impact on demand for SKY-broadcast matches. To control for this possible effect, a free-to-air dummy variable, $TV3$, is used in the model. The variable takes a value of 1 if the round robin match was broadcast on a free-to-air channel, and 0 if otherwise.

Other sporting events broadcast on match day may also represent substitution possibilities for television audiences. These events need not necessarily be broadcast at the same time as match i to act as substitutes; audiences may simply prioritise their viewing preferences between major sporting events within a day. For example, a viewer might forego an NPC match broadcast in the afternoon in order to view a rugby league international broadcast later that same evening. The availability of alternative sporting coverage can be expected to have a negative impact on

[5]The possibility that non-subscribers may also view live coverage by utilising the facilities of subscribers is ignored, for the purposes of simplifying the analysis.

demand for NPC rugby matches.

To accommodate the possible substitution effect engendered by other major sporting events considered popular alternatives to NPC rugby, a series of dummy variables—$GAMES$, $CRICK$, $LEAG$, $UNION$ and $TENNIS$—are included in the model. $GAMES$ takes on a value of 1 if either the Olympic or Commonwealth Games were shown on any sports channel available during the sample period on match day, and 0 otherwise; $CRICK$ controls for the effect of any international cricket matches (both the one-day and test variety) shown on match day; $LEAG$ captures the effect of any international or NRL rugby league matches broadcast on match day; $UNION$ picks up any international rugby union matches (such as the Tri-Nations competition) shown on match day; and $TENNIS$ captures the effect of any international tennis events broadcast on match day.[6,7] Data for the construction of these dummies were collected from the programme schedules of the three main television broadcasters of sports in New Zealand—TVNZ, CanWest and SKY.[8]

The broadcast times of matches on SKY can vary from week to week, and may be expected to influence television demand for matches. In particular, match demand is expected to increase during prime-time hours (say between 6:00pm and 8:00pm), but matches broadcast very early would be likely to have relatively weaker drawing power. Normally, five games are played during each round of the NPC 1st Division. These five games are generally scheduled on Friday nights and over the weekend. Friday night games usually kick-off between 7:00pm and 7:30pm. The weekend games usually kick-off at around 12:30pm, 2:30pm, between 4:00pm and 5:00pm, and 7:00 and 7:30pm. Four dummy variables, SAT, SUN, $4PM$ and $7PM$ are included to capture the effect of Saturday and Sunday matches, and 4:00pm and 7:00pm kick-offs, respectively.[9]

Over weekends, there are typically two or three NPC 1st Division matches on show each day. Given that viewers have finite leisure time, the availability of multiple matches to choose from may mean that viewers are forced to prioritise which games they watch. Combined with diminishing marginal utility effects, it is anticipated that as the number of games broadcast in a day increases, demand for individual matches would fall. A variable representing the number of other games broadcast on match day, $NOGAMES$, is included to capture these effects.

It is generally thought that viewers and spectators are, in part, drawn to sporting contests to watch superstar players display their skills (e.g., see Hausman and Leonard, 1997). Hence,

[6]Data on motorsport, golf, netball and yachting events were collected, but were omitted from the final estimation since there is very little variation (and therefore informational content) in the constructed dummies for those sports; motorsport and golf events occur too frequently, and netball and yachting events occur too infrequently. (Netball and yachting exhibited little variation even when aggregated into a composite dummy.)

[7]The Commission focussed on international sporting events because these are likely to have the greatest drawing power, and because national events occur so frequently that their inclusion would swamp the effect of any variation in demand generated by the international contests.

[8]Over the sample period TVNZ broadcast all sporting events on TV1, CanWest on TV3, and SKY on its three channels SKY1, SKY2 and SKY3. SKY 3 came online in 2004.

[9]Friday, 12:30pm, and 2:30pm dummies were not specified in the model in order to avoid the dummy variable trap.

it may be expected that contests involving unions that have more players that compete at an international level (Super 12 and higher) may be of a higher standard and therefore exert greater drawing power on viewers. A variable to capture the number of Super 12 players, $SUPER$, aims to control for this possibility.

Another measure of contest quality is $STAND$—a weighted average of competing unions' standings in the previous season and their current pre-match standings. $STAND$, in any given round, is calculated as follows:

$$\frac{1}{n}\left[(n-m+1)\frac{s_{t-1,j}+s_{t-1,k}}{2}+(m-1)\frac{s_{t,j}+s_{t,k}}{2}\right] \tag{4}$$

where j and k are the home and away unions, respectively, competing in match i; n is the total number of rounds in the competition; m is the number of the current round; s_t is each team's most up-to-date championship standings in the current season, t; and s_{t-1} is each team's final championship standings in the previous season, $t-1$. A low value for this variable suggests a high quality contest, which would be expected to induce greater audience interest. Therefore, a negative relationship between this variable and demand for televised matches is predicted.

The intuition behind taking a weighted average is that at the start of a season, a union's NPC standing in the previous season represents a very relevant measure of expected quality. As the present season evolves, viewers' expectations are updated by the most current information available, so current standings will likely become a more relevant measure of union quality. Values of $STAND$ are therefore updated accordingly, match by match.

It is hypothesised that the level of competitive balance within a season can influence the level of demand for individual matches. For example, it may be argued that if a season begins to shape up as a highly one-sided affair, and the outcome of the final competition standings become easy to predict, then interest in the competition may decline. To test this hypothesis, a measure of competitive balance, $CBALW$, is included in the model. This variable aims to capture the variation of competing unions' winning probability compared to the ideal standard deviation (based on winning probability) in a perfectly balanced league, and is calculated as follows:

$$\sigma_m\left(\frac{1}{2\sqrt{X}}\right)^{-1}, \tag{5}$$

$$\sigma^2=\frac{1}{X}\sum_{x=1}^{X}\left(q_{t,x}-\frac{1}{2}\right)^2$$

where X is the total number of unions in the competition; and q is each team's winning probability based on historical performance. From the way in which this variable is defined, a large value suggests a big deviation from the ideally-balanced league, and therefore a great deal of competitive imbalance. Hence, a negative relationship between $CBALW$ and television demand is anticipated.

Another factor that may attract television audiences is the presence of 'wild-card' teams, i.e., those unions whose future performances are difficult to predict from past results. On the other hand, some fans may be deterred by the inconsistency of a team's performance over time. In order to test whether team-specific uncertainty (as opposed to uncertainty relative to the performance of another team) has a role in explaining television demand for matches, two variables, $HMWPS$ and $AWWPS$, which capture the historical volatility of performance (in terms of the probability of winning) for the home team and away team, respectively, are included. This measure is calculated using win/loss data from all matches played by each team (until the current round, m) since 1997, and is updated with each successive round of competition.[10]

The UOH suggests that uncertainty of outcome is an important determinant of demand for sports. In order to test if this claim holds with respect to television viewers of NPC rugby, the Commission estimated equation (2) using several alternative measures of outcome uncertainty. The first of these, $STDDIST$, is the absolute value of the difference in pre-match league standings between the two competing unions, which, for each union, is calculated as a weighted average of its standings in the current and previous seasons:

$$\frac{1}{n}\left[(n-m+1)\left|s_{t-1,j}-s_{t-1,k}\right|+(m-1)\left|s_{t,j}-s_{t,k}\right|\right]. \tag{6}$$

Several empirical studies have used the difference in pre-match league standings between competing teams to measure outcome uncertainty, and to test the uncertainty of outcome hypothesis in relation to spectators at live matches.[11] The findings from these empirical studies are mixed. One problem with these studies is that they only consider the current season league standing difference since their data typically only covers one or two seasons. However, the current season standing difference may not adequately reflect the team quality. For example, if all the teams a weak team meets before the current game are weaker, that team could be high on the league table even though it may be a team of relatively poor quality. Conversely, if all the teams a strong team meets before the current game are stronger still, that team could could receive a low ranking on the league table. This is particular likely to occur towards the beginning of a season.

In this analysis, the difference in the weighted average between past and current season league standings is used to overcome this problem. As equation (6) shows, the weighted average measure is calculated so that at the beginning of the season, the outcome uncertainty is mainly derived from last season's standing difference. As the season proceeds (i.e., as $m \longrightarrow n$), outcome uncertainty will tend to derive more from the current season standing difference. The measure is therefore updated through time with information from the most recent round.

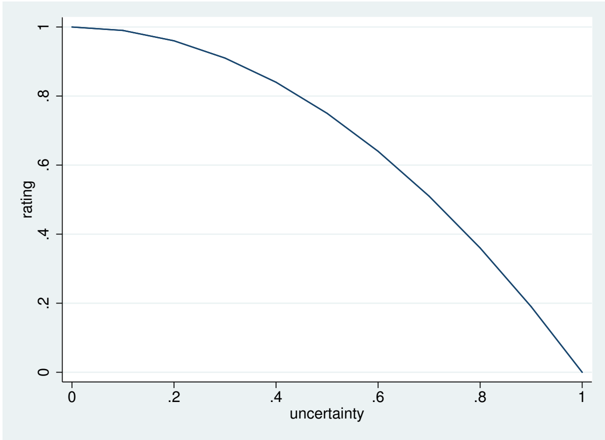
The second measure used in this study, $DHMWP$ is the absolute value of the difference in pre-match percentages of games won by each team, again weighted by performances in the current and previous season using the weights applied in equation (6):

$$\frac{1}{n}\left[(n-m+1)\left|p_{t-1,j}-p_{t-1,k}\right|+(m-1)\left|p_{t,j}-p_{t,k}\right|\right] \tag{7}$$

[10]Data on match outcomes for the Bay of Plenty were available only from 2000 onwards.

[11]See, for instance, Hart et al (1975), Borland and Lye (1992), Wilson and Sim (1995), Baimbridge et al (1996) and García and Rodríguez (2002).

Figure 1: Quadratic Form Uncertainty



Notes: This graph presents a stylised depiction of the UOH. The UOH states that as uncertainty over the outcome of a contest increases (i.e., as $UNCERT \longrightarrow 0$), demand for televised matches (ratings) also increases. In the limit, the contest becomes perfectly balanced and demand is maximised. The model developed in this paper tests for such a relationship. For expositional purposes demand and uncertainty are normalised to between zero and one in this Figure.

where p is each team's historical winning percentage.

The third measure used, $DHMWPS$, is the absolute value of the difference in the historical winning probability for each team based on pre-match for- and against-scores, once again weighted by performances in the current and previous season:

$$\frac{1}{n}\left[(n-m+1)\left|\pi_{t-1,j}-\pi_{t-1,k}\right|+(m-1)\left|\pi_{t,j}-\pi_{t,k}\right|\right] \tag{8}$$

where π is equal to the total points scored by the team in the season, divided by the sum of all points scored by the team and all points scored against it by opponents, in the same season.

The fourth measure, $DHMWPG$, is the absolute value of the difference between the competing teams' to-date winning probabilities, calculated using win/loss data on all matches the teams have faced each another in since the 1997 season.

Probability-based measures of outcome uncertainty, typically derived from betting odds, are commonly used in the literature. Betting odds may capture information on a team's performance history. However, their application as an uncertainty measure has been the subject of some criticism—in particular, that betting odds may not adequately reflect the expectations of sports fans because betting markets may not be efficient. For example, Kuypers (2000) and Levitt (2004) demonstrate using theoretical models that it is profit-maximising for bookmakers to distort odds away from those implied by 'true' probabilities to take account of bettor preferences. The last three uncertainty measures introduced have the advantage of being probability-based while avoiding the betting odds-bias criticism.

To allow for the possibility that the true form of the underlying model may be non-linear, the model was specified and estimated as a quadratic function of uncertainty, as well as a simple linear function. Figure 1 presents a stylised depiction of the UOH, which is tested for in this study. In this graph, demand (ratings) and uncertainty are normalised between zero and one. As the graph shows, the UOH states that as uncertainty over the outcome of a contest increases (i.e., as $UNCERT \longrightarrow 0$), demand for televised matches also increases. In the limit, the contest becomes perfectly balanced and demand is maximised. The estimated model tests for this relationship, holding all other factors constant. A (statistically significant) negative relationship between the uncertainty measures and the dependent variable would imply support for the UOH.

Some match-level data, including game dates, kick-off times, and round robin rosters, were supplied to the Commission by the NZRU. Match results (final scores, number of tries scored, etc.) were obtained from publicly available information on the TVNZ website. From these data, weekly championship points and rankings were calculated using the NPC competition points accumulation rules.[12] The cumulative weekly points standings were cross-checked with end-of-season final standings for consistency.

The key regression variables used in this analysis are summarised in Tables 1 and 2.

Question 1 *The Commission seeks comments or questions from interested parties on the methodology it has used in this study to evaluate which are the key drivers of television demand for NPC matches.*

C Empirical Results

The empirical results were obtained from data on round robin matches played between 2001 and 2004. 2005 match data were available, but population and income data could not be obtained from Statistics New Zealand in time. Also, population and household income data were not available for the Counties-Manukau province for 2001, which reduced the number of observations from 180 to 172.

The generalised least squares (GLS) estimation results for alternative model specifications (i.e., using different measures of outcome uncertainty and combinations of control variables) are reported in Tables 3 to 6. It can be seen from these Tables that the key results are very consistent across various specifications of the model.

The statistically significant positive effects on demand for televised NPC 1st Division matches derive from regional household income, team quality (in particular, the presence of Super 12 players), prime-time scheduling of broadcasts (vis-à-vis the $7PM$ dummy), and under most specifications, the occurrence of Ranfurly Shield matches. The estimated coefficients for all these variables have their expected signs. The estimated negative effects on demand derive from the number of other NPC games broadcast on match day, as expected, and Sunday broadcasts.

[12]Under NPC rules, a team is awarded four points for every win, two points for a draw, one bonus point for scoring four or more tries in a match, and one bonus point for losing a match by less than seven points.

It is possible that the latter result arises because Sunday matches are typically broadcast during the early afternoon, when viewers may have several other competing activities against which to prioritise the viewing of rugby.

The game significance measures ($PLAY$ and $RELEG$) were not found to be statistically significant. This perhaps reflects viewers' perceptions that the relative rankings within the 1st Division are more or less stable; there is not much likelihood of any but the traditionally top-ranked unions making the playoffs (i.e., not much chance of upset results), but at the same time, not much likelihood of any 1st Division unions being relegated to a lower competition.

Interestingly, although all the estimated coefficients of the substitute sports dummies had the correct signs, none proved to be statistically significant confirming what many fans have known all along—there is nothing quite like NPC rugby.

The estimated coefficient of the competitive balance variable had the correct sign, but was found to be statistically insignificant, and the team specific uncertainty measures were found to be statistically insignificant under all specifications.

Finally, none of the outcome uncertainty measures, neither in linear nor quadratic form, in any of the various specifications of the model considered, proved to be statistically significant. That is, the null hypothesis that the UOH does *not* hold could not be rejected.

For completeness, the degree of correlation between the various uncertainty measures used was checked. Only very weak correlation was found between the outcome uncertainty and competitive balance/team-specific uncertainty measures (the largest correlation coefficient was approximately 0.29). From this it can be concluded that $CBALW$, $HMWPS$, $AWWPS$, and $UNCERT$ capture different aspects of uncertainty, so it is not inappropriate to specify all these within the same model.

Question 2 *The Commission seeks comments or questions from interested parties on the key results of this study and, in particular, on its finding that the uncertainty of outcome is not a significant determinant of television demand for NPC matches.*

D Conclusion

This study set out to test the hypothesis that television audiences of NPC 1st Division matches find uncertainty of outcome attractive. Using data on SKY ratings for round robin NPC matches, historical game results, and provincial demographics, a demand equation, specified as a function of outcome uncertainty and several other control variables, was econometrically estimated.

One of the key findings was that none of the uncertainty of outcome variables used were statistically significant in explaining the variation in television demand for NPC matches. This suggests that the uncertainty of outcome hypothesis does not hold with respect to television viewers of 1st Division NPC matches. The modelling results suggest that other factors, such as household income (a proxy for ability to pay SKY subscription charges), prime-time scheduling of broadcasts, spectacle matches (such as Ranfurly Shield challenges), and team quality are important drivers of viewer demand.

Furthermore, there is no evidence to suggest that these results would not extend to the new Premier Division (PD) competition;[13] viewers of the new PD would be essentially the same individuals as those on which data is available under the old 1st Division, and there is nothing to suggest that the new competition format would significantly alter fans' underlying viewing preferences. Given the old 1st Division is the closest available structure to the new PD, for which there is no data yet, the Commission considers that the results from the present study greatly inform on the likely drivers of viewer demand under the new competition format.

The NZRU has provided little or no empirical evidence in support of its claim that television viewers find uncertainty of outcome desirable. The Commission is aware of only one published study that attempts to test this hypothesis, but that study relates to English Premier League Football, not New Zealand rugby union. The remaining available empirical evidence in support of the UOH relates to spectatorship at live matches rather than television audiences.

Two broadcasters supported the hypothesis in submissions. One of these—SKY—cited a few past instances where viewer ratings appeared to rise during 'close' match-ups (in one-day international cricket and All Blacks matches). However, the analysis provided by SKY does not control for other possible drivers of viewer demand, as done in this study, and 'uncertainty', or the 'closeness' of contest was ill-defined. Hence, no meaningful inferences can be made from that information.

Therefore, on the basis of the evidence available, including the results provided by this econometric work, the Commission's preliminary conclusion is that the benefits to television viewers that the NZRU claims would flow from closer NPC contests, as a result of implementing the proposed arrangements—the great bulk of expected benefits—are unlikely to materialise.

However, as noted earlier, the evidence does indicate that team quality (and in particular, the number of Super 12 players involved in a contest) is a key driver of audienceship. All the estimated coefficients for the variable $SUPER$ were statistically significant and exceeded a value of one. This suggests that some scale economies may exist from redistributing talent to weaker unions.

To see this, consider two separate contests—one characterised by the involvement of 20 Super players in total (a 'high' quality match), and another involving just 10 Super players in total (a 'low' quality match). Suppose redistribution policies remove two Super players from the first contest and transfer them to the second, i.e., a 10% reduction in Super players in the first contest, and a 20% increase in the second. Table 3, for example, suggests that a 10% increase (decrease) in the number of Super players involved in a contest would raise (reduce)

[13] In June 2005 the NZRU announced the introduction of a new competition structure. Commencing from the 2006 season, four teams from the old NPC 2nd Division—Counties-Manukau, Hawke's Bay, Manawatu and Tasman (an amalgamation of Nelson Bays and Marlborough)—would be promoted to the NPC 1st Division, which is to be renamed the NPC Premier Division.

television ratings by approximately 0.107 points (since the model is in log-linear form). So the redistribution of talent would be expected to generate a 0.107 point reduction in ratings from the first contest, but generate up to a 0.214 point increase in viewer ratings from the second—a net gain of 0.107 points. Hence, player redistribution policies (provided they have their intended effect of dispersing talent) may be desirable from the perspective of viewer demand.

In furthering its deliberations, the Commission needs to consider the strength of the link between the proposed arrangements and the quality of contest in the PD (i.e., the mechanism, if any, through which the quality of the competition may improve under the proposed arrangements), and how the impact on public benefits ought to be quantified.

Question 3 *The Commission seeks comments from interested parties on its finding that the quality of contest appears to be a significant driver of television demand for NPC matches. If it is a significant driver, how should this effect be quantified when assessing the public benefits likely to flow from implementing the proposed arrangements?*

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Table 1: Summary of Regression Variables

Variable	Description
POP_i	Natural logarithm of the total combined population of the two competing provinces in match i.
$PLAY_i$	The significance of match i for competing in the championship playoff.
$RELEG_i$	The significance of match i for competing in a relegation playoff.
RS_i	Dummy variable = 1 if match i is a Ranfurly Shield challenge, 0 if otherwise.
INC_i	Natural logarithm of average household income of the two competing provinces in match i.
$TV3_i$	Dummy variable = 1 if match covered by TV3, 0 if otherwise.
$GAMES_i$	Dummy variable = 1 if either the Olympic or Commonwealth Games broadcast on SKY, TV1 or TV3 on match day, 0 if otherwise.
$CRICK_i$	Dummy variable = 1 if an international cricket match broadcast on SKY, TV1 or TV3 on match day, 0 if otherwise.
$LEAG_i$	Dummy variable = 1 if an international or NRL rugby league match broadcast on SKY, TV1 or TV3 on match day, 0 if otherwise.
$UNION_i$	Dummy variable = 1 if an international rugby union match broadcast on SKY, TV1 or TV3 on match day, 0 if otherwise.
$TENNIS_i$	Dummy variable = 1 if an international tennis event broadcast on SKY, TV1 or TV3 on match day, 0 if otherwise.
SAT_i	Dummy variable = 1 if match day is Saturday, 0 if otherwise.
SUN_i	Dummy variable = 1 if match day is Sunday, 0 if otherwise.
$PM4_i$	Dummy variable = 1 if match kicks off at approximately 4pm, 0 if otherwise.
$PM7_i$	Dummy variable = 1 if match kicks off at approximately 7pm, 0 if otherwise.
$NOGAMES_i$	The number of other NPC 1st Division games broadcast by SKY on match day.
$SUPER_i$	Natural logarithm of the total number of Super 12 players competing in match i.
$STAND_i$	Weighted average of past and current (pre-match) NPC standings.
$CBALW_i$	The variation in unions' winning probability, compared to an ideal standard deviation based on the distribution of winning probability in a perfectly balanced league.
$HMWPS_i$	Standard deviation of the home team's historical winning probability.
$AWWPS_i$	Standard deviation of the away team's historical winning probability.

Table 2: Summary of Uncertainty of Outcome Variables

Variable	Description
$STDDIST_i$	Difference in NPC standings of unions competing in match i.
$STDDIST_i^2$	Quadratic form of $STDDIST_i$.
$DHMWP_i$	Difference in pre-match winning percentage between unions competing in match i.
$DHMWP_i^2$	Quadratic form of $DHMWP_i$.
$DHMWPS_i$	Difference in pre-match winning probability between unions competing in match i based on the unions' historical for and against scores.
$DHMWPS_i^2$	Quadratic form of $DHMWPS_i$.
$DHMWPG_i$	Difference in pre-match winning probability between unions competing in match i based on the competition history between the two unions.
$DHMWPG_i^2$	Quadratic form of $DHMWPG_i$.

Notes: $STDDIST$, $DHMWP$ and $DHMWPS$ are measures of the relative historical performance of competing teams, weighted between the current and previous season, in absolute value terms.

Table 3: SKY Ratings and the Difference in NPC Standings

	Without $SUPER$		With $SUPER$		With $SUPER$ & $STDDIST^2$	
	Coeff.	$P \geq z$	Coeff.	$P \geq z$	Coeff.	$P \geq z$
POP	0.27	0.33	−0.11	0.69	−0.11	0.69
$PLAY$	−0.11	0.52	−0.17	0.31	−0.17	0.32
$RELEG$	−0.07	0.45	−0.05	0.64	−0.05	0.64
RS	0.55*	0.08	0.45	0.14	0.44	0.15
INC	3.32**	0.04	3.95***	0.01	3.96***	0.01
$TV3$	0.10	0.69	0.04	0.86	0.04	0.86
$GAMES$	−0.29	0.37	−0.33	0.29	−0.33	0.29
$CRICK$	−0.07	0.71	−0.19	0.34	−0.19	0.34
$LEAG$	−0.38	0.17	−0.29	0.29	−0.28	0.30
$UNION$	−0.13	0.71	−0.09	0.80	−0.09	0.81
$TENNIS$	−0.26	0.18	−0.33	0.20	−0.25	0.20
SAT	−0.15	0.79	0.19	0.73	0.19	0.73
SUN	−1.11***	0.01	−1.02**	0.02	−1.02**	0.02
$PM4$	0.13	0.66	0.19	0.51	0.20	0.51
$PM7$	0.98***	0.00	1.04***	0.00	1.04***	0.00
$NOGAMES$	−0.50*	0.06	−0.66***	0.01	−0.66***	0.01
$SUPER$	.	.	1.07***	0.00	1.08***	0.00
$STAND$	−0.10	0.20	−0.02	0.85	−0.01	0.85
$CBALW$	−0.54	0.29	−0.31	0.53	−0.31	0.54
$HMWPS$	−2.00	0.26	−0.17	0.93	−0.15	0.94
$AWWPS$	−1.95	0.25	−0.42	0.80	−0.43	0.80
$STDDIST$	−0.02	0.58	−0.04	0.32	−0.06	0.75
$STDDIST^2$	.	.	.	.	0.00	0.93
$CONST$	−16.18*	0.09	−22.36**	0.02	−22.42**	0.02
Observations	172		172		172	
R^2	0.5615		0.5910		0.5910	
Wald χ^2	173.48		215.17		213.84	

Notes: *** indicates significance at 1% level; ** indicates significance at 5% level; * indicates significance at 10% level.

Table 4: SKY Ratings and the Difference in Winning Percentage

	Without $DHMWP^2$		With $DHMWP^2$	
	Coeff.	$P \geq z$	Coeff.	$P \geq z$
POP	−0.13	0.63	−0.11	0.71
$PLAY$	−0.16	0.35	−0.15	0.36
$RELEG$	−0.05	0.59	−0.04	0.67
RS	0.49*	0.10	0.48	0.11
INC	4.20***	0.01	4.14***	0.01
$TV3$	0.03	0.92	0.03	0.89
$GAMES$	−0.33	0.29	−0.33	0.30
$CRICK$	−0.17	0.40	−0.15	0.45
$LEAG$	−0.32	0.24	−0.30	0.26
$UNION$	−0.12	0.73	−0.17	0.64
$TENNIS$	−0.24	0.22	−0.23	0.24
SAT	0.21	0.71	0.13	0.81
SUN	−1.05***	0.01	−1.08***	0.01
$PM4$	0.17	0.56	0.15	0.60
$PM7$	1.04***	0.00	1.02***	0.00
$NOGAMES$	−0.68***	0.01	−0.65**	0.01
$SUPER$	1.02***	0.00	1.01***	0.00
$STAND$	−0.03	0.73	−0.03	0.67
$CBALW$	−0.28	0.58	−0.31	0.54
$HMWPS$	−0.27	0.89	−0.23	0.90
$AWWPS$	−0.72	0.68	−0.50	0.78
$DHMWP$	0.10	0.84	1.35	0.42
$DHMWP^2$	.	.	−1.95	0.43
$CONST$	−23.64***	0.01	−23.49***	0.01
Observations	172		172	
R^2	0.5883		0.5900	
Wald χ^2	211.83		209.57	

Notes: *** indicates significance at 1% level; ** indicates significance at 5% level; * indicates significance at 10% level.

Table 5: SKY Ratings and the Difference in Winning Probability (For and Against Scores)

	Without $DHMWP^2$		With $DHMWP^2$	
	Coeff.	$P \geq z$	Coeff.	$P \geq z$
POP	−0.18	0.59	−0.18	0.61
$PLAY$	−0.15	0.36	−0.15	0.35
$RELEG$	−0.06	0.51	−0.06	0.55
RS	0.53*	0.08	0.52*	0.09
INC	4.76***	0.01	4.82***	0.01
$TV3$	0.03	0.91	0.03	0.90
$GAMES$	−0.44	0.16	−0.44	0.17
$CRICK$	−0.19	0.31	−0.19	0.32
$LEAG$	−0.27	0.31	−0.27	0.31
$UNION$	−0.14	0.70	−0.13	0.71
$TENNIS$	−0.26	0.17	−0.27	0.16
SAT	0.33	0.55	0.28	0.61
SUN	−1.00***	0.02	−0.99**	0.02
$PM4$	0.25	0.40	0.25	0.41
$PM7$	1.06***	0.00	1.06***	0.00
$NOGAMES$	−0.72***	0.01	−0.70***	0.01
$SUPER$	1.11***	0.00	1.09***	0.00
$STAND$	−0.04	0.59	−0.04	0.57
$CBALW$	−0.05	0.93	−0.04	0.93
$HMWPS$	2.72	0.26	2.71	0.27
$AWWPS$	0.31	0.89	0.38	0.87
$DHMWPS$	−1.10	0.37	0.77	0.85
$DHMWPS^2$	.	.	−5.99	0.63
$CONST$	−27.52***	0.01	−27.96***	0.01
Observations	172		172	
R^2	0.5937		0.5944	
Wald χ^2	201.29		198.16	

Notes: *** indicates significance at 1% level; ** indicates significance at 5% level; * indicates significance at 10% level.

Table 6: SKY Ratings and the Difference in Winning Probability (Past Contest History)

	With $DHMWPG$		With $DHMWPG$ & $DHMWPG^2$		With $DHMWPG$ & $DHMWP$	
	Coeff.	$P \geq z$	Coeff.	$P \geq z$	Coeff.	$P \geq z$
POP	−0.15	0.65	−0.07	0.84	−0.12	0.74
$PLAY$	−0.17	0.29	−0.16	0.32	−0.16	0.34
$RELEG$	−0.07	0.50	−0.07	0.48	−0.07	0.46
RS	0.55*	0.07	0.52*	0.09	0.54*	0.08
INC	4.31**	0.02	4.02**	0.03	4.19**	0.03
$TV3$	0.03	0.91	0.03	0.91	0.03	0.89
$GAMES$	−0.40	0.21	−0.40	0.21	−0.43	0.18
$CRICK$	−0.21	0.27	−0.21	0.26	−0.20	0.28
$LEAG$	−0.30	0.26	−0.26	0.34	−0.29	0.28
$UNION$	−0.18	0.61	−0.17	0.63	−0.17	0.64
$TENNIS$	−0.25	0.19	−0.26	0.18	−0.25	0.19
SAT	0.31	0.57	0.33	0.55	0.32	0.55
SUN	−0.90**	0.04	−0.87**	0.04	−0.91**	0.03
$PM4$	0.24	0.42	0.24	0.41	0.25	0.39
$PM7$	1.09***	0.00	1.11***	0.00	1.08***	0.00
$NOGAMES$	−0.70***	0.01	−0.70***	0.01	−0.70***	0.01
$SUPER$	1.04***	0.00	0.95***	0.01	1.03***	0.00
$STAND$	−0.05	0.50	−0.06	0.42	−0.04	0.58
$CBALW$	−0.16	0.75	−0.15	0.77	−0.13	0.80
$HMWPS$	2.24	0.37	1.88	0.46	2.27	0.36
$AWWPS$	−0.10	0.97	−0.56	0.82	−0.02	0.99
$DHMWPG$	−0.59	0.28	0.61	0.68	−0.51	0.38
$DHMWPG^2$	.	.	−1.66	0.37	.	.
$DHMWP$	.	.	.	.	−0.78	0.54
$CONST$	−24.40**	0.03	−22.94**	0.04	−23.93**	0.03
Observations	172		172		172	
R^2	0.5941		0.5961		0.5951	
Wald χ^2	202.30		200.33		198.54	

Notes: *** indicates significance at 1% level; ** indicates significance at 5% level; * indicates significance at 10% level.