COMPETITIVE BALANCE IN THE NBA: Comparative analysis of Eastern and Western Conferences.

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ABSTRACT

The aim of this paper is to approach the definition and measurement of the competitive intensity, taking data from both conferences of the National Basketball League of EEUU (NBA) through 20 seasons. The tools used in the analysis come from the industrial economic, having been utilized to detect domain positions or oligopolistic structures. Moreover, this work adds the NRC indicator or number of relevant competitors, inspired by the outcomes achieved on the market’s natural structure. The results of this study show that both Conferences present a high level of competitive intensity being the Eastern Conference slightly more competitive, despite the fact that the regulation applied is identical. It is also proved that Competitive Balance is not an exogenous regressor of the demand function estimation, by testing the causality through Granger Causality Test, in such a way that instrumental variables might be used for measuring the scale of the effect.

JEL: mnsckmds ckm nfv

Keywords: basketball; competitive balance; number of relevant competitors; Granger Causality Test; Instrumental variables.
1. INTRODUCTION

The level of competitiveness is frequently discussed in different countries and social spheres, from media to sport professionals and supporters. However, it is usual to draw conclusions on the bases of perceptions and partial indicators. For this reason, Competitive Balance is also one of the most long-standing propositions in the Sports economic scope. In addition to this fact, it creates an uncertainty of outcome, which is a factor widely accepted as determinant of the sporting events demand, generating many policies focused on fostering and improving the Competitive Balance (Rottemberg, 1956; El-Hodiri & Quirk, 1971). Therefore, there is a collective interest in maintaining reasonable quality in playing strength to stimulate the willingness to pay the admission ticket.

By using tools coming from Economic Theory, in particular from Industrial Economic, it is possible to conduct a comparison exercise between competitive levels of different competitions. Some of the popular indicators used to explain inequalities are Concentration Ratio, Herfindahl Index or Gini Coefficient. However the interest of this paper is focused on building a new indicator, which is called NRC or Number of Relevant Competitors derived from the application of Gibrat’s Law. In industrial economics empirical tests of Gibrat’s Law show whether the smaller firms in an industry grow faster than the larger firms. The NRC is based on the independency of firm size and its growth.

Once the results have been analyzed, they will be used to check the direction of the correlation between Competitive balance and Demand, estimated by literature. A possible endogeneity will be proved as well, setting alternative methods of estimation to increase the accuracy of the results.

This paper is focused on Basketball, particularly American Basketball, whose competitive structure and regulation are very different from European basketball leagues, as usually happens with all the American sports. Therefore, it is aimed to submit the competitive level in which both conferences (Eastern and Western) are developed trying to give an answer to the historical debate about the balance in the distribution of teams between both conferences.

This work is linked to the line of studies such as Michie and Oughton (2004), Brandes and Frank (2007) among others. The rest of the article is structured as follows. The next section provides a review of the previous literature in the topic. Section 3 describes the NBA system of competition and organization. Section 4 and 5 explain the methodology used to measure the competitive balance as well as the results and conclusions. Causality theory and results from Granger Causality test are shown in section 6, while the measurement of the effect of competitive balance in demand in an accurate way is developed in section 7. The final section provides a summary and conclusions.
2. LITERATURE REVIEW OF THE COMPETITIVE BALANCE

The Competitive Balance refers to the balance in sport capabilities of teams and their possibilities to win any game (Michie et al, 2004). Simultaneously, Competitive Balance means uncertainty of predicting results. Generally speaking, the competitive balance allows thinking about two fundamental topics (Fort, 2013): firstly, it gives the chance to measure the impact of different competition policies and secondly, it permits to evaluate its relation with fan demand. Szymanski (2003) examined the Competitive Balance from three different perspectives: a) match uncertainty which refers to the uncertainty about the result of a special match (between two teams), b) season uncertainty which refers to uncertainty about matches of a season c) championship uncertainty which refers to the dominance of a limited number of teams over the league. The core index presented in this work is the Number of Relevant Competitors is based on this last approach.

As Rotter (1956) established through the Louis-Schmeling Paradox, the greater the level of Competitive Balance of the league is, the harder to predict the result of games and then the competition becomes more attractive from the demand point of view. His statement, also known as the Uncertainty of outcome hypothesis, said that "uncertainty of outcome in necessary if the consumer is to be willing to pay admission to the game". If there is a progressive decrease in the Competitive Balance, then the number of spectators attending to the venues and also the TV viewers will diminish. Needless to say, this Competitive Balance depends on the distribution of talent among competitors or which is the same, depends on the quality of the teams and the sports events. Therefore both, institutions and academics, try to design mechanisms that force the creation of uncertainty as well as to investigate their real effects on competitiveness and demand, in different sports, countries and terms. Teams control the merchandising; leagues have attempted to transfer resources from stronger, more successful teams to smaller to incentive the overall benefit of the league as a whole. Concepts such as gate revenue sharing, centralized TV rights, cap salary, Drafts or luxury tax are the core of the debate, having been accepted by American Sports Institutions as essential for enhance the survival of the competitions. However this agreement does not exist in European competitions due to the fact that most of the teams are involved in playing two competitions, the domestic one and the continental one. As long as there is not a common framework, the adoption of some regulatory measures in the National League could create unbalance in the European Competitions.

Perhaps this is one of the reasons why does not exist an agreement among academics about if some mechanism aid to balance. Fort and Quirk (1995) conclude that neither draft nor revenue sharing improve the Competitive Balance contrary to Vrooman (1995) and Kesenne (2000) who accept the hypothesis of revenue sharing increases competitive intensity.

Another issue of debate is if the Szymanski (2003) assumptions reflect the reality or some contradictions could happen in specifics frameworks. For example, attendance has been growing.
during the last two decades in most European football leagues despite of the fact that competitive balance did not significantly change (Brandes and Frank, 2007). The institutions and teams hold that if there is not a clear relationship between Competitive Balance and Demand then none regulatory mechanism will be justified. Therefore, it seems undeniably interesting for the sports industry to analyze in more detail the relationship between competitive balance and fan attendance and how these variables interact with each other. In this paper the NBA is used as a laboratory due to the fact that it has absorbed almost all the regulating policies.

3- NBA COMPETITION SYSTEM AND ORGANIZATION

Due to its complexity and the relevant differences regarding European competitions, first of all it is necessary to typify briefly the competition system of the NBA and the way in which the Institution is organized.

Nowadays there are 30 teams competing in the league, but along the time series of data analyzed it is found seasons with 27 or 28 teams. In order to organize efficiently the league, minimizing as much as possible the amount of journeys and the distance covered, the league is divided into two Conferences: Eastern and Western, with 15 teams in each one. Within each Conference, in turn, 3 divisions are set out with 5 teams in each one: Atlantic, Central and Southwest in Eastern, Northwest, Pacific and Southwest in Western Conference.

Each team plays four times against teams of its same division, between 3 and 4 times against teams of the other two divisions of its own conference and finally 2 times against teams of the other conference (home and away). Therefore, each team along the regular season plays 82 games. NBA is the only competition in EEUU where all the contestant teams meet at least twice, which means that the yearly season ticket ensures the opportunity of watching playing every team of the league at least once.

At Institutional level, the NBA operates like a cooperative where the 30 teams are owners of the competition. The league in itself contains control and regulating elements in order to keep a genuine balance of the competition. This way, even though there are teams in small markets (Oklahoma, Milwaukee, Portland,...) they should have the same capability to compete that other teams belonging to bigger markets (Los Angeles, New York, Miami,...). This entails to assume several regulatory policies (cap salary from 1983, Draft, luxury tax) as well as a specific organizational model. One of the most important rules of the NBA is every franchise operates for themselves in a 75-mile radius around the venue. Far away from this distance the incomes are shared equally among all the teams.
4- MEASURING COMPETITIVE BALANCE

A structure that fosters competitiveness shall be a structure in which it is difficult for an agent to capture differential results towards the rest and, as a consequence, the gap in the results of the agents will be diminished. There are many ways to measure competitive balance in sports competitions, or which is the same, to measure uncertainty of outcome, all of them based on a set of indicators commonly used in industrial literature, following the line proposed by Rottemberg (1956). The choice of the most appropriate measure should be done considering the time horizons: match, season and long-run (Quirk and Fort, 1997). This paper is focus on the seasonal horizon and in order to give robustness to the results making possible to interpret the economic consequences, several measures of competitive balance are presented in the empirical analysis.

THE CONCENTRATION RATIO

As an initial approach, it is customary to use a concentration index. This concentration index assesses the cumulative market fraction attributable to the top \( m \) agents in a particular industry, allowing for a comparison between teams.

\[
C = \sum_{i=1}^{m} s_i
\]

where \( s_i \) is a ranked vector of the market share of the top \( m \) agents.

This index could be indicative of the existence of both, domain positions and oligopolistic structures, in a particular market, when its value is close to zero. This kind of index could be used to measure the fraction of the industry’s total production that is accounted for by a given number of agents in the sector. This way, for example, \( C_1 \) represents the market share of the leader, \( C_4 \) is the concentration ratio accounted for by the top four firms, and \( C_8 \) would be a measure of the dominance of the teams qualifiers for the play off, etc. In such a way that the leader ratio could be calculated as a method of expressing its capability as regards others agents of the sector. It is usual to compare the leader share with the share corresponding to a homogeneous distribution of the market \( 1/m \). Similarly, it is appropriate to compare the concentration ratio of the top four firms \( C_4 \) with the distribution in case of a homogeneous market, that is \( 4/m \). However, for several authors, such as Utt and Fort (2002), these measures generate problems in terms of usefulness when it comes to sports outcomes.
THE HERFINDAHL- HIRSCHMAN INDEX

The Herfindal-Hirschman Index is a measure of concentration defined as the sum of the squares of the market shares of all the agents in the industry. This index was developed with the aim of analyzing inequalities between firms in a specific sector. In analytical terms, being \( n \) the total number of agents, this index is expressed as follows,

\[
H = \sum_{i=1}^{N} s_i^2
\]

where \( N \) denotes the number of participating teams and \( s \) the share of wins during a season. The possible values of the index are bounded between 0 and 1. Its maximum value \( H = 1 \) corresponds to a monopoly situation, and it tends toward zero in the case of an infinite number of agents. Generally speaking, the larger the coefficient (closer to 1), the lower the number of agents supplying the market and/or the bigger the differences in size. While the lower the index value, the lower the degree of market concentration and more agents of similar size supplying the market. When a homogeneous distribution of the market between agents happens, the index value end up being \( 1/n \). Since sports competitions have a fixed number of contestants, the value of \( H \) will be indicative of the difference in their size, that is, in their ability to capture market share.

THE GINI COEFFICIENT

The Gini coefficient is a measure of inequality typically used as an indicator of the income distribution among the population, but it could be used to assess any kind of unequal distribution. The Gini coefficient ranges from 0 to 1, where 0 corresponds to complete equality (the income is distributed homogeneously), and 1 corresponds to complete inequality (a total asymmetric distribution). The proposal of Deaton (1997) is taken as the expression of Gini Index,

\[
G = \frac{N + 1}{N - 1} + \frac{2}{N(N - 1)u} \sum_{i=1}^{n} P_i X_i
\]

where \( u \) is the average value of the reference variable, \( P_i \) is the rank \( P \) of person \( i \), with variable \( X \), which represents a vector ranked from the highest to the lowest income of \( N \) people.

NUMBER OF RELEVANT COMPETITORS

In a market where a particular number of agents exists with different market shares, it is possible to establish the number of relevant competitors taking as a reference the market shares of each one of the teams, in a sports context. The market power arises in any process where the
competitors grow at a rate independent of their resources, that is, the growth of firms over time could be represented by a simple stochastic model in which the probability of a firm’s size changing by a given percentage is independent of its size (Buzzel, 1981). This process, known as Gibrat’s Law (1931), recognizes the empirical fact that there is a correlation between the sizes, or between the market shares of the firms operating in a particular business sector. The underlying assumption is that the relation between the market share of the i-th firm and the market share of the 2i-th firm is a constant proportion (or “size ratio”). This hypothesis inspires what some authors name as natural market structures, Ijiri and Simon (1971), Buzzell (1981), and in analytical terms could be characterized by,

\[ f = \frac{s_{2i}}{s_i} \quad \text{being } f \text{ constant for each } i. \]

By establishing the relation in reference to the leader firm, it is obtained that,

\[ s_1^f = s_1 \]
\[ s_1^f = s_2 \]
\[ s_1^f = s_4 \]

hence it could be deduced a general expression, \( s_1^{f_{\ln 2}} = s_i \), or similarly in terms of the rank achieved by the firm i, \( R_i \), it is obtained, \( s_1^{R_i} = s_i \).

This expression could be written in the semi-logarithmic model proposed by Buzzell (1981), which enables to make empirical contrast. The semi-logarithmic distribution expresses the relative sizes of firms in a market as a function of each firm’s size rank as follows:

\[ \ln S_i = \alpha + \beta R_i + \epsilon_i \quad (1) \]

Where \(-\beta = \ln i/\ln 2\); \( \ln S_i \) is the dependent variable and represents the logarithm of the market share of the firm in the i-th position of the rank; \( \ln R_i \) is the independent variable which is calculated as the logarithm of the rank position; and finally \( \epsilon_i \) is the error term. The interpretation of the results allows identifying the market share of the leader as \( e^{\alpha + \beta} \).

Cooke and Cox (1977) suggest that the size ratio is a useful summary measure of the structure of a given market because there is a close and direct relationship between the value of the ratio and the number of “significant” competitors in a market (Buzzell, 1981). From the parameter \( \beta \) it could be derived the number of relevant competitors, or which is the same in sports context, the number of competitors with a relevant market share in relation to the leader share. The value of \( \beta \) is an estimation of the concentration fraction. Its interpretation in sports competitions is the greater the fraction, the lower the level of competitiveness. Since the beginning of the season implies a reset to zero in the scores and all the teams start the competitive term in the same conditions, the outcome of this analysis establishes the number of relevant competitors each season. Gibrat’s effect only happens in the course of one season considering that the share obtained...
from previous competitions has no impact in the current competition. This proposal has been considered by classics as the determination of natural market structure. The National Leagues are competitions where the number of contestants remains constant, and the results of one season come from the competitive process developed between all the teams by playing the games corresponding to the number of total teams \((N-1)\cdot N\). The systematic repetition of this effect season by season emphasizes the role of the regulatory body as a Competitive Moderator. Dobson, Goddart and Ramlogan (2001) argue about the convergence of the incomes using temporal models, which analyze the convergence of incomes. This convergence is detected when a balance in the competition exists. Furthermore, it is argued about the high correlation between economic and competitive inequality.

The natural structure models consider that is the market itself, which, thanks to its dynamics, generates the asymmetries finally observed, contrary to the market efficiency hypothesis, in which some of the economic theories are based. The asymmetry seems to be determined by the behavior of the agents in the market, when the regulatory body does not act imposing balancing mechanism between agents.

Once all the coefficients have been estimated through the regression, the next step is to calculate the Number of relevant competitors by applying the following expression,

\[
NC = (\ln S_{av} - \alpha)/\beta \quad (2)
\]

where \(S_{av}\) is the average share of each season. It seems reasonable to take the average share of the season or the value corresponding to an homogeneous distribution, that is \(1/n\), in order to obtain those teams that have possibilities of winning the championship, considering the leader share.

5- DATA AND COMPETITIVE INTENSITY

In order to obtain the indexes and the number of relevant competitors it has been analyzed 20 seasons of the NBA, from 1992/93 to 2012/13, considering the number of wins achieved by each team and their position in the final ranking. It should be noted that 2 of these 20 seasons have a smaller number of games due to the lock out, having been 47 the total number of games in season 1998/99 and 66 in 2011/12, instead of 82 games. There is another important organization change in the structure of the competition since in season 2004/05 the number of divisions in each Conference started to be 3 instead of 2. A summary of the data is presented in tables 1 and 2.
The most representative concentration measures of each conference are shown in Table 3, from which an exercise of comparative statistics could be drawn. Regardless of the structural changes of the competition, in general terms, the data show stability through the time series analyzed, appreciating the biggest differences in the H-H of the teams playing in the Western Conference. The average of the H-H index for the Eastern and Western Conferences stands at 7% and 8% respectively, while the \( C_8 \), which is the market share of the teams qualified for playing the play-off, ranges from 5.8% to 7.1% in Eastern and from 5.3% to 7.9% in Western, showing a slight inequality considering that the share in the case of an equitable distribution of the market would be 5.3% in leagues with 15 teams, 5.7% for 14 teams and 6.1% for 13 teams.

The main principle drawn from the results is both Conferences in NBA show high levels of competitive intensity, or which is the same, high level of Competitive Balance with low concentrations of the market. After testing the significance of the differences of the averages (see the appendix, Table 1A), it is observed that both conferences are significant different from the point of view of \( C_8 \) and H-H indexes, or which is the same, Western Conference would show less competitive intensity. Therefore, the interpretation of the \( C_8 \) leads to the conclusion that teams playing in Eastern conference have more difficulties to play the play off in order to win the championship.

The results provided by the estimation of the semi-logarithmic model are shown in Table 4. These results prove that the coefficients \( \alpha \) and \( \beta \) are significant, both at a global level. Slight differences between Eastern and Western are perceived in the estimated model, considering that the addition of \( \alpha \) and \( \beta \) determines the market share of the leader and \( \beta \) itself is an estimation of the
## TABLE 3: MAIN INDICATORS OF CONCENTRATION

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<tr>
<th>SEASON</th>
<th>EASTERN</th>
<th>WESTERN</th>
<th>EASTERN</th>
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<th>EASTERN</th>
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concentration fraction. The estimated values are in the line of the conclusions obtained with the statistics analysis, making clear that the Eastern is the conference with the lowest $\beta$ coefficient corresponding to the situation of greater competitiveness between teams, in terms of ability to win games.

The numbers of relevant competitors are shown in table 3, as another indicator of the concentration. These coefficients have been obtained applying expression 2, once the coefficients are estimated. Despite the fact that there are slight variations from one season to another in both conferences, on average is the Eastern which shows a bigger number of relevant competitor or in other words, teams with enough potential to win the competition (7.2 in East against 6.8 in West). Therefore, all the results and analysis lead to a consistent conclusion in terms of Competitive Balance, that is, the competition with less level of concentration has a greater number of relevant competitors.

6- CAUSALITY BETWEEN COMPETITIVE BALANCE AND DEMAND

Within the theory of competitive balance, it has been assumed that attendance is an endogenous variable and indicators of competitive balance have been used as exogenous variables. However, as Brandes and Frank (2007) argue, this distinction seems to be arbitrary, as it is necessary to know where competitive balance comes from. Moreover, it is interesting to check the existence of simultaneity between both variables that leads to endogeneity, in order to carry out a better estimation of the real relationship between both. To that aim the number of relevant competitors from both conferences are taken as indicator of competitive balance and the average attendance to the venues through each season as a measure of attendance (using the logarithmic transformation to decrease the scale). In the following, both conferences are integrated in the same competition in order to make a global analysis. The objective of this section is to prove the endogeneity of demand and the exogeneity of competitive balance in the classical demand function, or in other words, to examine for causal links:

$$Log(Attendance) = \alpha + \beta * NRC_t + \epsilon_t$$ (3)
Linking to Hall, Szymanski and Zimbalist (2002) and Brandes and Franck (2007) this article proposes the Granger causality test in order to check the direction of the relationship between competitive balance and fun attendance. As Engle and Granger (1987) explain, when the experiment is not controlled, the demonstration of the cause-effect relation is not an easy task. Under the traditional approach, which is based on a regression model, the only conclusion that could be drawn is the quantification of the correlation, but the existence and the nature of the relation is not disputed. Granger causality test will help to determine whether one variable is useful in forecasting another, adding the advantage that this test allows addressing the direction of interaction. After checking the absence of co-integration, it is chosen the number of lags to be included using an information criterion. As the results from the table 2A show, all the criteria agree about the convenience of choosing 1 lag. Table 5 provides the estimation results on Granger Causality tests based on the average attendance to the venues during each season and the number of relevant competitors as indicator of competitive balance. The p-value leads to reject both null hypotheses, in such a way that two conclusions could be drawn; on one hand competitive balance seem to play an important role in determining the fan attendance to the venues on a seasonal level. In policy terms, any regulatory mechanism would be justified to keep the balance. But simultaneously, attendance causes a significant effect on competitive balance in such a way that there is evidence of the endogeneity of competitive balance.

7- QUANTIFYING THE SCALE OF THE EFFECT

The calculation of the effect between competitive balance and attendance is originally made by using an OLS regression. However, the conclusion drawn in the previous section adds a complication since the endogeneity of the regressors cause inconsistency in the parameter estimation. The simultaneity between our dependent variable and the regressor generates a correlation between the explanatory variable and the error term, thereby obtaining biased estimators.

\[ \text{Cov}(\mu_i, X_i) \neq 0 \]

The inconsistency of OLS means that changes in x are associated not only with changes in y but also changes in the error \( u \). The instrumental variables estimator provides a way to nonetheless obtain consistent parameter estimates (Cameron and Trivedi, 2005). The more difficult challenge is to find the appropriate instrument \( z \), which should have the property that changes in \( z \) are associated with changes in \( x \) but not lead to change in \( y \). Generally speaking, variable \( z \) will be an instrumental variable for the regressor \( x \) if \( z \) is uncorrelated with the error (exogeneity condition) but at the same time it is correlated with the regressor \( x \) (condition of relevance).

Theoretically, a suitable instrument for competitive balance could be the salary budget of the teams due to, firstly the relationship between salary and talent and secondly the relationship
between distribution of the talent and uncertainty of the outcome. Therefore, a database has been built considering the salary of every player of each team from season 1992/93 to 2012/13. Initially, it is proved the appropriateness of the instrument. Testing the first condition of exogeneity is not possible since \(u\) is not observed, contrary to the condition of relevance, whose proof, which is shown in table 3A in the appendix, comes from the regression of the expression 4.

\[
\log (NCR) = \alpha + \beta \log(payroll) + \varepsilon \quad (4)
\]

The result leads to accept the significance of the instrument and its relevant effect over the regressor. Moreover the \(R^2\) shows an acceptable level in goodness of fit (0.6567). Table 6 shows the estimation using instrumental variables in front of the OLS estimation. As expected \(R^2\) is higher with OLS estimation but our objective is to estimate the causal effect between attendance and competitive balance instead of maximizing the goodness of the fit. The scale of CB effect on demand (0.2864) is slightly underestimated using OLS method instead of IV (0.254). The last check advisable of being carried out would be the Sargan test, where the rejection of the \(H_0\) is usually interpreted as evidence that the instrument \(z\) is endogenous and therefore, the IV estimator is consistent. By making a regression of the error term, obtained from instrumental variable estimation, against the exogenous variable and the instrument, we conclude there is no evidence against the validity of the instrument “payroll”. Thereby, the accurate scale of the effect of competitive balance on demand, measuring competitive balance in terms of number of relevant competitors and demand as the attendance of spectators to the venues, is 0.2864.

8- CONCLUSIONS

In this paper a comparison exercise of the competitiveness level in Eastern and Western Conferences of the NBA has been conducted through 20 seasons (from 1992/93 to 2012/13). Apart from the reference variables widely used in industrial sectors to measure the concentration of the market, it is added the number of relevant competitors as an indicator of the competitive intensity, which is based on the theory of natural structure of the markets and inspired by Gibrat’s law. After checking the significance of the differences obtained with all the indicators, two conclusions are drawn from this first analysis. Firstly, both conference and the NBA as a whole are competitions.

\begin{table}
\centering
\caption{Output from VAR Granger causality on fan attendance and competitive balance measures}
\begin{tabular}{lcc}
\hline
Null Hypothesis & DF & Chi-Sq & Prob \\
\hline
Attendance does not Granger cause NRC & 1 & 3.1016 & 0.078* \\
NRC does not Granger cause Attendance & 1 & 5.153 & 0.023** \\
\hline
\end{tabular}
\end{table}
with high level of competitiveness where the uncertainty of the outcome is plausible. However, there is reliable evidence that the distribution of the teams between both conferences is not so balanced as expected since the Eastern Conference shows systematically higher levels of competitive balance being more difficult to play the play-off phase by any team in Eastern than in Western.

Once the competitive balance indicator is defined (that is, number of relevant competitors), raises the question of why the competitive balance is measured. The answer comes from the Rottenberg’s hypothesis that the uncertainty of the outcome is a necessary requirement to increase the willingness to pay admission to game of the potential fans. As long as this statement is valid, the regulatory mechanisms applied by institutions, specifically the NBA, will be justified.

Reality places some surprising observations, which call into question the assumption. Therefore, the first step before quantifying has been to check the way of interaction between competitive balance and fan attendance using the Granger Causality test. The results mainly allow to draw two conclusions. On one hand, the competitive balance plays a crucial role for fan attendance at seasonal level, and NBA fans put emphasis on competitive balance among other factors. But on the other hand, there is evidence of endogeneity of the competitive balance, or which is the same, both variables cause effect each other.

Taking into account the conclusions achieved until that moment, the last step has been to quantify the scale of the effect through the classical regression of demand function. However, evidence point out the inappropriateness of the OLS method to estimate due its lack of consistency and the bias generated by the simultaneity of the considered variables. For this reason, an alternative has been presented, using instrumental variables as a more convenient method of estimation. The instrumental variable, payroll or salary budget of the teams is suitable since meets the conditions of relevance and exogeneity. Therefore, it is possible conclude that the effect that competitive balance has on demand reaches the value of 0.2864, which reveals that, despite of the fact that it is significant (justifying the regulatory mechanisms applied in NBA), there are another variables that in future studies should be considered to characterize the demand function with higher accuracy.

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>IV</th>
<th>2SLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constante</td>
<td>9.066</td>
<td>8.98</td>
<td>8.98</td>
</tr>
<tr>
<td></td>
<td>(0.1263)</td>
<td>(0.144)</td>
<td>(0.1958)</td>
</tr>
<tr>
<td>NRC</td>
<td>0.254</td>
<td>0.2864</td>
<td>0.2864</td>
</tr>
<tr>
<td></td>
<td>(0.048)</td>
<td>(0.054)</td>
<td>(0.073)</td>
</tr>
<tr>
<td>R2</td>
<td>0.6975</td>
<td>0.6868</td>
<td>0.5785</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE 6: ESTIMATION OF DEMAND FUNCTION USING OLS AND IV
REFERENCES


Cameron and Trivedi (2005) 'Methods and Applications'. Cambridge University Press


APPENDIX

**TABLE 1A: SIGNIFICANCY OF THE DIFFERENCES ON AVERAGE**

<table>
<thead>
<tr>
<th></th>
<th>H-H</th>
<th>C₆</th>
<th>GINI</th>
<th>NCR</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>EASTERN</td>
<td>WESTERN</td>
<td>EASTERN</td>
<td>WESTERN</td>
</tr>
<tr>
<td></td>
<td>0.070262</td>
<td>0.08114</td>
<td>0.6443</td>
<td>0.70851</td>
</tr>
<tr>
<td></td>
<td>0.000125</td>
<td>5.35 e-0.5</td>
<td>0.231</td>
<td>0.2</td>
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**TABLE 2A: SELECTION ORDER CRITERIA**

<table>
<thead>
<tr>
<th>lag</th>
<th>AIC</th>
<th>HQIC</th>
<th>SBIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-8.83251</td>
<td>-8.82277</td>
<td>-8.73449</td>
</tr>
<tr>
<td>1</td>
<td>-9.37041*</td>
<td>-9.34118*</td>
<td>-9.07634*</td>
</tr>
<tr>
<td>2</td>
<td>-9.15389</td>
<td>-9.10517</td>
<td>-8.66376</td>
</tr>
<tr>
<td>3</td>
<td>-8.95021</td>
<td>-8.882</td>
<td>-8.26404</td>
</tr>
<tr>
<td>4</td>
<td>-9.01766</td>
<td>-8.92996</td>
<td>-8.13543</td>
</tr>
</tbody>
</table>

**TABLE 3A: TESTING CONDITION OF RELEVANCE**

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t</th>
<th>P &gt; t</th>
</tr>
</thead>
<tbody>
<tr>
<td>logpayroll</td>
<td>0.1219</td>
<td>0.0205</td>
<td>5.93</td>
<td>0</td>
</tr>
<tr>
<td>constant</td>
<td>0.4905</td>
<td>0.36328</td>
<td>1.35</td>
<td>0.193</td>
</tr>
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