Free Agent Auctions and Revenue Sharing: A Simple Approach

Rockerbie, Duane

University of Lethbridge

March 2007

Free Agent Auctions and Revenue Sharing: A Simple Exposition

Duane W. Rockerbie*

March 2007

Abstract

This paper uses a simple approach to address the issue of how revenue sharing in professional sports leagues can affect the allocation of free agent players to teams. To affect the allocation of free agents, the imposition of revenue sharing must alter the ranking of bidding teams in terms of maximum salary offers. Two types of revenue sharing systems are considered: traditional gate revenue sharing and pooled revenue sharing. The paper suggests that team rankings for ability to pay are not affected by pooled revenue sharing, however the distribution of player salaries will be compressed. Traditional gate revenue sharing can alter the ability to pay rankings for teams, depending upon playing schedules and the closeness of revenues between closely ranked teams.

* Department of Economics, University of Lethbridge, Lethbridge, Alberta, Canada T1K 3M4. email: rockerbie@uleth.ca

1. Introduction

The economics of professional sports literature is rich in papers that consider the effects of different types of revenue sharing systems on player salaries and league parity. For good reason, revenue sharing is an important phenonmenon to study since it is unique to the business of professional sports and is an important characteristic of the odd antitrust status given to professional sports leagues. Some important papers are El Hodiri and Quirk (1971), Fort and Quirk (1995), Marburger (1997) and Kesenne (2000), to name a few. Most of these papers focus on the effects of revenue sharing on league parity, but few focus on the effect of revenue sharing on the allocation of scarce talent. An exception is Miller (2007) who uses a three-stage game theoretic model of competitive free agent bidding that incorporates initial bids and subsequent salary negotiations. With unequal revenue sharing (high revenue teams pay a higher share of revenue than low revenue teams) Miller (2007) shows that revenue sharing will not affect the allocation of free agents among winning bidders, although it will compress the salary distribution of free agents unequally.

This paper focuses on why professional sports leagues have tended to move away from gate revenue sharing towards pooled revenue sharing, using the argument that gate revenue sharing can distort the allocation of free agents among teams while pooled revenue sharing cannot. If the simple analysis done here is extended to the league voting model of Easton and Rockerbie (2005), one can see why pooled revenue sharing might receive more favorable votes among owners, particularly wealthy ones. The analysis is kept simple here and focuses on the mechanics of the two revenue sharing systems. Strategic behavior among clubs who anticipate revenue sharing is not considered, instead we assume that each club formulates a bid for a particular free agent in the off-season by taking its post revenue sharing revenue as given from the previous season. Any change in the league revenue ranking of a team will directly affect its ability to make a winning bid for a particular free agent. The next two sections of the paper discuss the effects of revenue on the allocation of free agents among competitive bidding teams under the more recently adopted pooled revenue sharing and the historic gate revenue sharing systems. The last section of the paper provides concluding remarks.

2. Pooled Revenue Sharing

In a pooled revenue sharing system, all teams in a league contribute a fixed percentage of local revenues in regular installments to a central league fund. On a specific date, each team receives a payment equal to an equal share of the fund. The definition of local revenues differs by professional league, but here we assume these are simply all revenues derived directly from the hosting of a game. To set up the model, we assume a professional sports league composed of N teams, each team playing each other team once at home and once on the road (this is not essential to the analysis). Before revenue sharing, each team earns revenue from home games equal to R_i^h which are not all equal. Home revenues are distributed on a continuum from the highest revenue team, R_1^h, to the lowest revenue team, R_N^h. The exact form of the revenue distribution is not important to the model developed here, but we will assume that it is uniform for convenience. To analyze the possibility of a team changing position in the revenue distribution after revenue sharing, we consider only the top two revenue earning teams in the league. If a reversal is possible, it should be possible between any other two teams in the league and our analysis is then sufficient. We ignore the case where $R_i^h = R_i^h(\alpha)$, but it is quite likely that imposing revenue sharing of any form will alter the optimal stock of talent for each team. That case is dealt with in detail in Miller (2007) and Easton and Rockerbie (2005).

After revenue sharing, net revenues for teams 1 and 2 are given by

$$R_1^* = \alpha R_1^h + \left(\frac{1-\alpha}{N}\right)\sum_{i=2}^{N} R_i^h = \alpha R_1^h + \left(\frac{1-\alpha}{N}\right)R_2^h + \left(\frac{1-\alpha}{N}\right)\sum_{i=3}^{N} R_i^h \tag{1}$$

$$R_2^* = \alpha R_2^h + \left(\frac{1-\alpha}{N}\right)\sum_{i=1,3}^{N} R_i^h = \alpha R_2^h + \left(\frac{1-\alpha}{N}\right)R_1^h + \left(\frac{1-\alpha}{N}\right)\sum_{i=3}^{N} R_i^h \tag{2}$$

The revenue sharing coefficient α is the share of home revenues that teams do not contribute to the central fund. Each team receives back some of its revenue contributed to the central fund, as well as some of the revenue from its nearest revenue rival.

$$R_1^* = \left(\frac{\alpha(N-1)+1}{N}\right)R_1^h + \left(\frac{1-\alpha}{N}\right)R_2^h + \left(\frac{1-\alpha}{N}\right)\sum_{i=3}^{N} R_i^h \tag{3}$$

$$R_2^* = \left(\frac{\alpha(N-1)+1}{N}\right)R_2^h + \left(\frac{1-\alpha}{N}\right)R_1^h + \left(\frac{1-\alpha}{N}\right)\sum_{i=3}^{N} R_i^h \tag{4}$$

A "reversal" is defined here as a situation where $R_1^h > R_2^h$ and $R_1^* < R_2^*$. To find a condition under which a reversal occurs, we take the difference $R_2^* - R_1^*$ and set it to be greater than zero.

$$R_2^* - R_1^* = \left(\frac{\alpha(N-1)+1}{N}\right)\left(R_2^h - R_1^h\right) + \left(\frac{1-\alpha}{N}\right)\left(R_1^h - R_2^h\right) > 0 \tag{5}$$

Simplifying (5) provides a necessary condition for central pool revenue sharing to create a reversal between the post-sharing revenues of teams 1 and 2.

$$\alpha\left(R_2^h - R_1^h\right) > 0 \text{ or } \alpha < 0 \tag{6}$$

Condition (6) is impossible as it requires the revenue sharing coefficient to be negative, therefore a reversal is not possible between the top two revenue teams with central pool revenue sharing. The two teams under consideration need not be the top two revenue teams in the league. The only requirement for the result is that one team has higher revenues than another team before revenue sharing. Without reversals, central pool revenue sharing should not affect the distribution of free agent talent among teams since the overall league rankings of revenues is unaffected. Revenue sharing will redistribute revenue from rich teams to poor teams and may compress the salary distribution of free agents, but it will not affect who the winning bidders will be.

3. Gate Revenue Sharing

Major league baseball and the National Football League used a gate revenue sharing system before the mid-1990's. In this system, each team gives a share of its gate revenue from a home game to the visiting team. The effect on a team's post-sharing revenue depends upon its schedule of games. For instance, a rich team that plays the majority of its road games against poor team opponents might suffer from gate revenue sharing. On the other hand, a poor team that plays the majority of its road games against rich teams will fair better than without revenue sharing. In the central pool revenue sharing system, this skewness in the post-sharing revenues depending upon the team schedule does not occur. With N teams operating in a league with a uniform distribution of home revenues and each team playing M < N of the teams only once, the post-sharing revenues for the richest team and second richest teams are given by

$$R_1^* = \alpha R_1^h + (1-\alpha)R_{1,2}^r + (1-\alpha)\sum_{1=3}^{M} R_{1,i}^r \tag{7}$$

$$R_2^* = \alpha R_2^h + (1-\alpha)R_{2,1}^r + (1-\alpha)\sum_{1=3}^{M} R_{2,i}^r \tag{8}$$

In (7) and (8), road games are denoted with an "r" and home games with an "h". We assume that team 1 has the highest revenue generating potential of any of the N teams regardless of who the visiting opponent is. This can be expressed as $R_{1,i}^h > \{R_{2,i}^h, R_{3,i}^h, \ldots R_{N,i}^h\} \forall i$. We further assume that each teams earns the same total home revenue regardless of opponent for a single game. For instance, team 1 earns the same total home revenue from each of its home games regardless of the opponent, but this constant home revenue is higher than the single game home revenue for any other team in the league regardless of opponent. The essential assumption is that fans do not care which team is visiting for a game, attendance is always the same. In fact, many papers have used this sort of revenue function where home attendance depends only on the winning percentage of the home team (Fort and Quirk (1995) as an example).

Taking the difference between the post-sharing revenues and making it positive gives

$$R_2^* - R_1^* = \alpha\left(R_2^h - R_1^h\right) + (1-\alpha)\left(R_{2,1}^r - R_{1,2}^r\right) + (1-\alpha)\left(\sum_{i=3}^{M} R_{2,i}^r - \sum_{i=3}^{M} R_{1,i}^r\right) > 0 \tag{9}$$

The last term in (9) captures the effect on post-sharing revenues of different playing schedules for teams 1 and 2. This difference could be positive if team 2 plays higher revenue teams on the road than team 1 does. For now we assume the difference is zero for simplicity, however we will deal with differing schedules later in this section. By the assumption of identical home gate revenues for any opponent ($(M-1)R_{1,2}^r = R_2^h$ and $(M-1)R_{2,1}^r = R_1^h$), condition (9) reduces to

$$\left(R_2^h - R_1^h\right)\left(\frac{\alpha M - 1}{M-1}\right) > 0 \text{ or } \alpha < \frac{1}{M} \tag{10}$$

Although condition (10) is mathematically possible, it places a severe restriction on the size of the revenue sharing coefficient that causes a post-sharing revenue reversal between team 1 and team 2. The National Football League used $\alpha = 0.6$ up to the mid-1990's while major league baseball used roughly values of 0.8 and 0.95 for the National League and the American League. Condition (10) virtually requires the high revenue teams to become the low revenue teams by switching their revenues.

It could be the case that if team 2 plays higher revenue teams on the road than team 1, a reversal will occur. This amounts to assuming that the last term in (9) is positive. For convenience we now assume that team 1 does not play team 2, perhaps because they operate in different divisions or even different leagues (such as the American League and the National League before interleague games). Condition (9) is then

$$R_2^* - R_1^* = \alpha\left(R_2^h - R_1^h\right) + (1-\alpha)\left(\sum_{i=3}^{M} R_{2,i}^r - \sum_{i=3}^{M} R_{1,i}^r\right) > 0 \tag{11}$$

The condition for a reversal can be found to be

$$\alpha < \frac{1}{1 - \dfrac{R_2^h - R_1^h}{\sum R_{2,i}^r - \sum R_{1,i}^r}} \tag{12}$$

Since $R_2^h - R_1^h < 0$, $\alpha > 0$ is assured in (12). If $R_2^h - R_1^h$ is small, then the condition for α becomes more relaxed, that is, the value for α can be larger and a reversal can still occur. This makes sense since the needed post-sharing drop in revenues for team 1 is quite small in order to see a reversal. If $\sum R_{2,i}^r - \sum R_{1,i}^r$ is large, the condition for α also becomes more relaxed. This also makes sense since a more unbalanced revenue schedule in favor of team 2 is more likely to cause a post-sharing revenue reversal.

4. Summary

This short paper has addressed the question of whether the distribution of free agents among winning bidders is altered by two different forms of revenue sharing: central pool revenue sharing and gate revenue sharing. In a simple ascending bid auction, if a team bids up to the surplus received by the next lowest surplus team from signing the free agent, plus one dollar, the higher bidder will win the free agent. This will be true no matter what the shape of the revenue distribution is as long as the team revenue rankings are preserved. A reversal was defined as a situation where a higher revenue team moves down in the rankings of team revenues after revenue sharing. Revenue sharing then affects the distribution of free agents by changing the team revenue rankings. The model assumed that the league is composed of N teams with a uniform distribution of revenues, although allowing for skewed revenue distributions will not change the results of the paper. Central pool revenue sharing cannot affect the distribution of team revenue rankings and hence cannot affect the allocation of free agents among winning bidders. Central pool revenue sharing will reallocate revenue from high revenue teams to low revenue teams and compress the distribution of free agent salaries. Gate revenue sharing can create a revenue reversal between two clubs if they are not far apart in pre-sharing gate revenues and the lower home revenue club plays a more lucrative revenue road schedule than the higher revenue club. Perhaps this why both the National Football League and Major League Baseball moved from gate revenue sharing to central pool revenue sharing in the mid-1990's.

References

Easton, S. and Rockerbie, D., "Revenue Sharing, Conjectures and Scarce Talent in a Sports League Model", *Journal of Sports Economics*, 6(4), 2005, 359-378.

El Hodiri, M. and Quirk, J., "An Economic Model of a Professional Sports League", *Journal of Political Economy*, 79(6), 1971, 1302-1319.

Fort, R. and Quirk, J., "Cross-Subsidization, Incentives and Outcomes in Professional Sports Leagues", *Journal of Economic Literature*, 33, 1995, 1265-1299.

Kesenne, S., “Revenue Sharing and Competitive Balance in Professional Team Sports”, *Journal of Sports Economics*, 1(1), 2000, 56-65.

Marburger, D., “Gate Revenue Sharing and Luxury Taxes in Professional Sports”, *Contemporary Economic Policy*, 15, 1997, 114-123.

Miller, P., “Revenue Sharing in Sports Leagues: The Effects on Talent Distribution and Competitive Balance”, *Journal of Sports Economics*, 8(1), 2007, 62-82.