The Optimal Level of Nearly Nothing is Zero: The Case of Competitive Imbalance in Pro Sports Leagues

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Abstract:

One tried and true economic lesson is that the optimal level of nearly nothing is zero. We analyze a particularly interesting case, the optimal level of competitive imbalance in pro sports leagues. In leagues where season ticket sales dominate team revenues, there is *more imbalance* than under the planner's optimum. In leagues where single-game ticket sales dominate revenue, a cursory analysis suggests the single-game ticket league chooses *more imbalance* than the planner's optimum. The results for both leagues enlighten policy analysis. Many areas for further research are suggested.

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There is no question the level of play has decreased. Now, do games become more exciting? Are teams more evenly matched? No question. Is that good for the game or not? I don't know. I really don't know. I ask that question all the time.
—NFL Hall of Fame Quarterback Troy Aikman, quoted in Pedulla (2003).

I was a fan for many years. I ran a club, and one thing I've known, I've been convinced of, is that every fan has to have hope and faith. If you remove hope and faith from the mind of a fan, you destroy the fabric of the sport. It's my job to restore it.
—Major League Baseball Commissioner Bud Selig, quoted in Vass (2000).

I. Introduction

In this paper, we lay out the basic welfare foundation of optimal competitive imbalance in pro sports leagues and relate the outcome to the policy debate surrounding this crucial element of sports league production. Economists working in particular fields must go the extra mile to motivate their work if they ever hope to reach general audiences. Quoting Milton Friedman as saying "We are all Keynesians, now," Modigliani (1977) replied, "We are all monetarists." In this paper, our hope is (somewhat tongue in cheek) that "We are all sports fans, now." One can argue that many investigations are "field" investigations. But they become of "general enough" interest if either the industry is of significant interest or on the basis of how interesting the industry topic is itself.

Regarding the magnitude issue, simply adding up the reports in a source like *Forbes* magazine, the four major pro sports leagues in North America generate in the neighborhood of $20 billion in total revenues annually. That's about the same as web site development in the U.S. But the value and significance of sports goes far beyond this simple account. While there is no daily "web site development" section in any newspaper, there is a daily sports section in every newspaper in the country.

Turning to the topic itself, examination of the sports industry offers chances to apply economic techniques both for their own sake (and the interest of some economists) and to enlighten policy considerations. Neale (1964) detailed how the "peculiar economics" of sports leagues rests on the need for coordinated action by members of sports leagues in order for production to even occur. This coordinated behavior also proves essential if the main nemesis of sports league economic viability is to be overcome, namely, competitive imbalance.

The problems with competitive imbalance follow from Rottenberg's (1956) observations on outcome uncertainty. If outcomes on the field, court, or ice become too predictable, as when there are only a few very dominant teams, fans of perennially unsuccessful teams may stay away in droves and some teams in the league may actually go under. And even the teams that survive will have lower revenues if these disillusioned fans forsake the sport altogether. So, at least, the economics of coordinated league decision making is interesting.

But there also are policy implications important to many people. Leagues have a vested interest in managing the level of competitive imbalance. But some fans and most sportswriters lament imbalance in all North American leagues (NALs) except the National Football League (NFL). And in the NFL, the worry is that the league actually does not have enough imbalance (such as Hall of Fame quarterback Troy Aikman's quote at the top of this paper). Congressional hearings (U.S. Senate, 2001) have even been convened on the subject in the remaining NALs, the main point being that the fans of some teams do not really have the "hope and faith" referred to by Major League Baseball (MLB) Commissioner Bud Selig, also quoted at the top of the paper.

Economists interested in the sports industry long ago entered the fray, analyzing the various mechanisms employed by leagues to reduce competitive imbalance (comprehensive reviews are in Fort and Quirk, 1995; Szymanski, 2003; and Fort 2006b, Chapter 6). Did the reserve clause, and does the draft, reduce imbalance or not? Can taxes on talent and caps on the total payrolls that equalize spending on talent reduce competitive imbalance? What would happen to competitive imbalance if the antitrust laws were used to break the leagues up into economically competitive major league entities?

To us, the fascinating thing about all of this policy discussion—among fans, reporters, and economists—is that it lacks anything remotely resembling any competitive imbalance target. Nobody has examined the optimal level of competitive imbalance in the first place. In the literature on market power, there is comparison to the competitive paradigm that maximizes the sum of producers' and consumers' surpluses. But no welfare analysis exists for the policy debate in sports. It all seems to proceed on intuitive beliefs that raising the welfare of some fans by changing competitive imbalance would on net enhance general welfare. From the perspective of optimality constructs, this may simply be Pareto non-comparable advocacy.

As stated outright in the first sentence of this introduction, that is the point of this paper. We address the question of optimal competitive imbalance comparing decentralized league outcomes to the level of competitive imbalance that maximizes the sum of consumers' and producers' surpluses. We realize that other possible Pareto optimal outcomes might be developed, but the surplus maximizing approach does have the virtue of utilizing concepts that are conceptually amenable to relatively straightforward measurement and comparison in actual leagues. We also are not blind to the fact that some advocacy of particular mechanisms to reduce imbalance actually may be thinly veiled attempts to redistribute wealth from players to owners and among owners. But that is another virtue of our exercise, namely, allowing an assessment of the distributional consequences of various approaches to competitive imbalance with a firm grasp of the optimal target.

Our technique is based on the model most relevant to NALs, the competitive talent equilibrium model (originally, El Hodiri and Quirk, 1971). When owners fully use all information, the choice over the distribution of talent takes into full account the impacts of one team's talent choice on the other teams in the league. But league members know that each of their talent choices spill over to the rest and that competitive imbalance will be an issue with fans of lower quality teams. As a result, the league members (team owners) undertake cooperative behavior to fully distribute all relevant information about talent and its value. This is the logic behind rational expectations league equilibrium, applicable to NALs, because of the institutional factors that have created a common knowledge environment in such leagues. This argument, in detail, plus proof of the existence and uniqueness of such rational expectations equilibriums for NALs is provided in Fort and Quirk (forthcoming).

The paper proceeds as follows. In Section II, we compare the decentralized league model and planner's optimum for leagues that heavily utilize season ticket sales. Our analysis suggests that the planner would prefer less imbalance than this type of league will produce in its decentralized equilibrium. But the same cannot be said in general for leagues that heavily utilize single-game ticket sales, as we show in Section III. If fans of larger-revenue market teams like to see better opponents come to town more than fans of smaller-revenue teams do, the planner can prefer even *more imbalance* than the single-game ticket league generates in its decentralized equilibrium. However, a cursory look at the data for MLB suggests that smaller-revenue market fans enjoy it more when better opponents come to town. Both of these findings are important for the policy debate over competitive imbalance (especially the first, since it flies in the face of the arguments raised about competitive imbalance in the NFL) and Section IV lays out the policy implications. Conclusions and the many suggestions for future research round out the paper in Section V.

II. Optimal Competitive Imbalance in "Season Ticket" Leagues

In leagues like the NFL, season ticket sales dominate team revenue functions. The NFL has only 8 home games and two preseason games to sell. Team Marketing Report (2006) tabulates average seat prices weighted by the proportions of different types of seats in stadiums for all NFL teams. The highest of these is about $90 per game suggesting a season ticket price in the neighborhood of $900. If the team performs below expectations, fans have only lost the value of the few games they then choose not to attend. So football owners are able to do what every owner would like to be able to do, namely, transfer the risk that the team performs below expectations to fans. Fans confronted primarily with season ticket options must make their estimate of the value of that purchase primarily on the quality of the home team. Further, in terms of post-season chances, every game in the NFL is more important to fans, even those against poorer opponents, dampening the importance of visiting team quality in the fan purchase decision.

For “season ticket” leagues, we assume demand depends upon own ticket price and the team’s own winning percent. We further assume a league at a given absolute level of play, the major league level, and that all differences among teams at that level are relative differences (extensions are in Marburger, 1997, and Kesenne, 2000). This builds Rottenberg’s outcome uncertainty observation into the model since fans care about relative competition. Our model also is restricted to gate and attendance-related local revenue that can be portrayed as proportional to ticket price (Heilmann and Wendling, 1974). This abstracts from local TV revenue but, at least for the NFL, local TV is a relatively minor item in team revenues. We assume no team-specific contributions to the value of talent (Vrooman, 1996). Finally, in order to derive our comparisons between the league and the planner, there is no need to delve into any mechanisms used to alter the league outcome such as revenue sharing. The competitive talent market model assumes leagues have already used those instruments in their pursuit of profits. Those interested in the impacts of revenue sharing on the league in this model (and the one in the next section) are referred to Fort and Quirk (forthcoming).

Let $D_i(t_i, w_i)$ denote the demand for tickets to games of team i, where t_i is the price of a ticket and w_i is win percent for team i. Also let p equal the price of talent, that is, the price of one unit of winning percent. The profit function for team i is:

(1) $\pi_i = t_i D_i(t_i, w_i) - p\, w_i$, i = 1, …, n.

At a league equilibrium the adding-up constraint must hold, that is, $\sum_{i=1}^{n} w_i = \frac{n}{2}$. We let asterisks denote equilibrium values; $t_i^*(w_i)$ is the ticket price chosen to maximize profits,

p^* is the equilibrium price of talent. Given p^*, the team owner chooses w_i to maximize profits in expression (1) with the following league equilibrium conditions:

$$\text{(2)} \quad \frac{d\pi_i}{dw_i} = t_i^* \frac{\partial D_i}{\partial w_i} - p = 0, \ i = 1, \ldots, n, \text{ and } \sum_{i=1}^{n} w_i^* = \frac{n}{2}, \ i = 1, \ldots, n.$$

Expression (2) shows that all team owners set marginal revenue at the gate with respect to talent equal to the marginal cost of talent. In expression (2), note that even though t is a function of w, so that there are terms involving $\frac{\partial t}{\partial w}$, it turns out that because t is chosen to maximize revenue for any value of w, the expression given in (2) does give the correct first-order conditions. Further, this marginal revenue function, $t_i^* \frac{\partial D_i}{\partial w_i}$, i = 1, …, n, is the demand for winning percent by each team. Now, since the price of talent is the same for all teams in equilibrium, so too will be their marginal revenues, that is:

$$\text{(3)} \quad t_i^* \frac{\partial D_i}{\partial w_i} - t_j^* \frac{\partial D_j}{\partial w_j} = 0, \ i, j = 1, \ldots, n.$$

We begin our analysis by imposing the real world observation that there are larger-revenue and smaller-revenue markets in the league in the following way. Consider the case of an invariant ranking of attendance demand, a ranking that holds for all common values of w. By this type of invariant ranking we mean that if $D_i > D_j$ for a common value of w then the same is true for all common values of w. We exploit this ranking throughout the paper as our definition of larger-revenue and smaller-revenue markets; team i is a larger-revenue market team and team j is the (relatively) smaller-revenue market team. This seems reasonable to us especially over any relevant team or league planning horizon since the location of teams is completely in the hands of the league itself.

To see the impact of this invariant ranking, consider a league where competitive imbalance literally is zero (by (3), this can be true if and only if all teams have identical talent demand). For this situation, equilibrium in expression (3) holds at a constant vector $w^* = 0.500$ for all teams. But now, following our invariant ranking convention, suppose that team i has larger talent demand than the remaining teams $j \neq i$. In the presence of such a "larger-revenue market" team, if $w^* = 0.500$ for all i = 1,…, n, then the left-hand side of (3) would surely be greater than zero. The only way to satisfy expression (3) is to increase w_i^* and reduce the other w_j^* for all $j \neq i$ so that the adding-up constraint holds. When w_i^* has been increased enough to satisfy expression (3), then for all $j \neq i$, we'll have $w_i^* > w_j^*$ and $t_i^* > t_j^*$. We summarize these results as follows:

> <u>Proposition 1</u>: In an n-team season ticket league, with a competitive talent equilibrium, with invariant ranking of attendance demand, owner and league profits are maximized, for all $j \neq i$, if and only if $w_i^* > w_j^*$ and $t_i^* > t_j^*$.
>
> <u>Corollary 1</u>: In an n-team season ticket league, with a competitive talent equilibrium, with invariant ranking of attendance demand, owner and league profits are maximized, at a constant vector $w^* = 0.500$ if and only if talent demands are identical for all i, j = 1, …, n and for all values of w.

Generally, the league equilibrium exhibits competitive imbalance with larger-revenue market teams winning more than smaller-revenue market teams. The only time this will not be true is if there are no larger- and smaller-revenue markets to begin with, that is, talent demand is identical in all markets.

We next consider the planner's optimum. For simplicity, we take all costs to be rents and the monopoly pricing power of each team as given. Taking the revenue maximizing season ticket prices to be $\hat{t}_i$, the planner chooses the vector w (the distribution of talent) to maximize the sum of fans' (consumers') and owners' (producers') surpluses:

$$(4)\quad \phi = \sum_{i=1}^{n}\left[\int_{\hat{t}_i}^{\infty} D_i(t_i, w_i)\,dt_i + \hat{t}_i D_i(\hat{t}_i, w_i)\right],$$

and we still will have the adding-up constraint. Let $L = \phi + \lambda\left(\frac{n}{2} - \sum_{i=1}^{n} w_i\right)$ and Leibnitz' Rule yields the first-order conditions:

$$(5)\quad \frac{dL}{dw_i} = -\frac{d\hat{t}_i}{dw_i} D_i(\hat{t}_i, \hat{w}_i) + \int_{\hat{t}_i}^{\infty} \frac{\partial D_i}{\partial w_i} dt_i + \frac{\partial \hat{t}_i}{\partial w_i} D_i(\hat{t}_i, \hat{w}_i) + \hat{t}_i \frac{\partial D_i}{\partial w_i} = \lambda,$$

$$i = 1, \ldots, n, \text{ and } \sum_{i=1}^{n} \hat{w}_i = \frac{n}{2},\ i = 1, \ldots, n.$$

Simplifying, we have that $(\hat{t}_i, \hat{w}_i)$ must satisfy:

$$(6)\quad \hat{t}_i \frac{\partial D_i}{\partial w_i} - \hat{t}_j \frac{\partial D_j}{\partial w_j} = \int_{\hat{t}_j}^{\infty} \frac{\partial D_j}{\partial w_j} dt_j - \int_{\hat{t}_i}^{\infty} \frac{\partial D_i}{\partial w_i} dt_i,\ i, j = 1, \ldots, n.$$

$$\text{and } \sum_{i=1}^{n} \hat{w}_i = \frac{n}{2},\ i = 1, \ldots, n.$$

Before we move on to the comparison of the league outcome and the planner's optimum, we observe that the planner's optimum, itself, has similar characteristics to the league equilibrium outcome, albeit at a different level of competitive imbalance (as we get to directly). The only time the planner's optimal level of competitive imbalance is zero is when the demands for talent are identical. If true, the right-hand side of expression (6) is zero and we're back to the same logic governing expression (3) for perfect balance and the resulting Corollary 1. But if team i again occupies the "larger-revenue market" with higher talent demand then the planner also will prefer competitive imbalance (albeit at a different level than the league as we get to directly). Since the logic is precisely the same, we summarize the planner's outcome as follows (note that the levels of w and t are distinguished here from those in Proposition 1 and its corollary):

> Proposition 2: In an n-team season ticket league, with a competitive talent equilibrium, with invariant ranking of attendance demand, the planner's optimum $\left(\hat{t}, \hat{w}\right)$ has $\hat{w}_i > \hat{w}_j$ and $\hat{t}_i > \hat{t}_j$, for all $j \neq i$.
>
> Corollary 2: In an n-team season ticket league, with a competitive talent equilibrium, with invariant ranking of attendance demand, the planner's optimum $\left(\hat{t}, \hat{w}\right)$ has a constant vector $\hat{w} = 0.500$ if and only if talent demands are identical for all i, j = 1, …, n and for all values of w.

And here we have the result that satisfies the title of this paper. The optimal level of competitive imbalance is nearly never zero; unless demands are identical, the optimal level of competitive imbalance still has the larger-revenue market teams winning more games than their smaller-revenue market counterparts.

Canes' (1974) offered an intuitive view of Proposition 2 and its corollary long ago. As long as some fans are willing to pay more for quality than others, equalization of team quality is inefficient. If equalization really were the key from the fan standpoint, leagues would have their own profit incentive to provide it. This isn't really surprising. Precisely the same factors that drive competitive imbalance also would explain a host of "unbalanced" competitively determined economic opportunities across geographic locations such as shopping opportunities and other entertainment offerings.

And we come to the comparison of the league's revenue maximizing choice and the planner's optimum. Comparing the first-order conditions in (3) to the first-order conditions in (6), it is clear that the increase in the larger-revenue owner's talent that is required to get to the revenue maximizing level of league imbalance is larger than the amount producing the planner's optimal level of imbalance. As we move away from a completely balanced league when marginal revenue of talent becomes larger for team i, we only have to increase w_i enough to get to a positive number in the planner's case, namely, $\int_{\hat{t}_j}^{\infty} \frac{\partial D_j}{\partial w_j} d\hat{t}_j - \int_{\hat{t}_i}^{\infty} \frac{\partial D_i}{\partial w_i} d\hat{t}_i > 0$ on the right-hand side of expression (6). For the league, enough more talent must be added to get all the way to zero on the right-hand side of expression (3). A shorter move away from perfect balance for the same league with invariant attendance demand ranking means less competitive imbalance in the planner's optimum than in the distribution of talent that maximizes only league revenues:

> Proposition 3: In an n-team season ticket league, with a competitive talent equilibrium, with invariant ranking of attendance demand, the owner of team i chooses a higher level of quality, and the remaining owners $j \neq i$ a lower level of quality, than in the planner's optimum; the owners in a league would choose more competitive imbalance than occurs for the planner's optimum.

So, for the season ticket league, reducing imbalance below the level chosen by the league on its own would be welfare improving. This happens because $\int_{\hat{t}_j}^{\infty} \frac{\partial D_j}{\partial w_j} d\hat{t}_j$ and $\int_{\hat{t}_i}^{\infty} \frac{\partial D_i}{\partial w_i} d\hat{t}_i$ in (6), part of the planner's problem but not for the league, covers the marginal impacts of talent choice on fans' net surpluses in the move to higher-quality demand functions. Since we use the competitive talent equilibrium model, we stress that this difference does not occur due to externalities in the league decision making process. The difference is solely determined by the presence of marginal impacts on consumers' surpluses in the planner's optimization problem.

III. Optimal Competitive Imbalance in "Single-Game Ticket" Leagues

In leagues like MLB, single-game ticket sales dominate the revenue structure of each team. Team Marketing Report (2006) lists the highest weighted average ticket price across the league at about $46 suggesting a season ticket price over $3,000. Unlike football, the larger number of games in the MLB season, even at lower ticket prices, puts the fan at much greater monetary risk should their team perform below expectations. Resale at season ticket prices around $3,000, for a disappointing team, is tough. So baseball owners are forced into more single-game sales than football owners. This means that the quality of the visitor plays a much larger role in fan purchase decisions. Indeed, lately, baseball owners have begun variable ticket pricing by opponent.

In the "single-game ticket" league case, we assume that the owner chooses a ticket price t_{ij} for games against each visiting team to maximize profit, given the demand for tickets to games against that visitor that depends upon ticket price and the winning percents of both teams, $D_{ij}\left(t_{ij}, w_i, w_j\right)$. All other assumptions are as in the season ticket league case. Profit for team i is given by:

$$(7)\quad \pi_i = \sum_{j \neq i}^{n} t_{ij} D_{ij}\left(t_{ij}, w_i, w_j\right) - p\, w_i \text{, } i = 1, \ldots, n.$$

Also, at an equilibrium, the adding-up constraint will be binding.

We recycle some notation from the previous section and let an asterisk denote equilibrium values. Let t_{ij}^{*} be the profit maximizing price against team j. Given p*, team i chooses w_i to maximize profit taking into account the predicted effect of this choice on the choices of other teams induced by the choice of w_i. The league equilibrium conditions are:

$$(8)\quad \frac{d\pi_i}{dw_i} = \sum_{j\neq i}^{n}\left[t_{ij}^{*}\left(\frac{\partial D_{ij}}{\partial w_i}+\frac{\partial D_{ij}}{\partial w_j}\frac{dw_j}{dw_i}\right)+D_{ij}\frac{dt_{ij}^{*}}{dw_i}\right]-p^{*}=0,\ i=1,\ \ldots,\ n,$$

$$\text{and } \sum_{i=1}^{n} w_i^{*}=\frac{n}{2},\ i=1,\ \ldots,\ n.$$

Now, at the margin, all teams have identical marginal revenues, and all team owners know it. This is taken to imply that all teams $j \neq i$ reduce their winning percents by an equal amount in response to the unit increase by team i so that $\frac{dw_j}{dw_i} = -\frac{1}{n-1}$ for all $j \neq i$, i, j = 1, …, n.. Substituting into (8), the equilibrium vector w* satisfies:

$$(9)\quad \sum_{j\neq i}^{n}\left\{t_{ij}^{*}\left[\frac{\partial D_{ij}}{\partial w_i}-\left(\frac{1}{n-1}\right)\frac{\partial D_{ij}}{\partial w_j}\right]+D_{ij}\frac{dt_{ij}^{*}}{dw_i}\right\}$$

$$-\sum_{k\neq j}^{n}\left\{t_{kj}^{*}\left[\frac{\partial D_{kj}}{\partial w_k}-\left(\frac{1}{n-1}\right)\frac{\partial D_{kj}}{\partial w_j}\right]+D_{kj}\frac{dt_{kj}^{*}}{dw_i}\right\}=0,\ k\neq j,$$

$$\text{and } \sum_{i=1}^{n} w_i^{*}=\frac{n}{2},\ i=1,\ \ldots,\ n.$$

What can we notice about this league equilibrium outcome? Again, examining (9), the only time the single-game ticket league would choose perfect balance is when talent demands are identical for all common values of w for all teams. Further, using our invariant demand ranking convention, by the same logic used for the season ticket league, we'll have $w_i^* > w_j^*$ and $t_i^* > t_j^*$. This generates the following for the single-game ticket league:

> <u>Proposition 4</u>: In a single-game ticket league, with a competitive talent equilibrium, with invariant ranking of attendance demand, owner profits are maximized, for all $j \neq i$, if and only if $w_i^* > w_j^*$ and $t_{ij}^* > t_{ji}^*$.
>
> <u>Corollary 4</u>: In a single-game ticket league, with a competitive talent equilibrium, with invariant ranking of attendance demand, owner and league profits are maximized, at a constant vector $w^* = 0.500$ if and only if talent demands are identical for all i, j = 1, …, n .

For the planner's problem, we make the same assumptions about costs as rents and write the planner's objective function as:

$$(10)\quad \phi = \sum_{i=1}^{n}\sum_{j\neq i}^{n}\left[\int_{\hat{t}_{ij}}^{\infty} D_{ij}\left(t_{ij}, w_i, w_j\right)dt_{ij} + \hat{t}_{ij} D_{ij}\left(\hat{t}_{ij}, w_i, w_j\right)\right].$$

Again, let $L = \phi + \lambda\left(\frac{n}{2} - \sum_{i=1}^{n} w_i\right)$ and Leibnitz' Rule yields the first-order conditions:

$$(11)\quad \frac{\partial L}{\partial w_i} = \sum_{j\neq i}^{n}\left[-\frac{\partial \hat{t}_{ij}}{\partial w_i} D_{ij}\left(\hat{t}_{ij}, \hat{w}_i, \hat{w}_j\right) + \int_{\hat{t}_{ij}}^{\infty}\frac{\partial D_{ij}}{\partial w_i} dt_{ij} + \frac{\partial \hat{t}_{ij}}{\partial w_i} D_{ij}\left(\hat{t}_{ij}, \hat{w}_i, \hat{w}_j\right) + \hat{t}_{ij}\frac{\partial D_{ij}}{\partial w_i}\right]$$

$$+\sum_{j\neq i}^{n}\left[-\frac{\partial \hat{t}_{ji}}{\partial w_i} D_{ji}\left(\hat{t}_{ji}, \hat{w}_i, \hat{w}_j\right) + \int_{\hat{t}_{ji}}^{\infty}\frac{\partial D_{ji}}{\partial w_i} dt_{ji} + \frac{\partial \hat{t}_{ji}}{\partial w_i} D_{ji}\left(\hat{t}_{ji}, \hat{w}_i, \hat{w}_j\right) + \hat{t}_{ji}\frac{\partial D_{ji}}{\partial w_i}\right] = \lambda,$$

i = 1, …, n,

and $\sum_{i=1}^{n} \hat{w}_i = \frac{n}{2}$, i = 1, …, n.

Simplifying, we have the vectors $\hat{t}$ and $\hat{w}$ satisfying:

$$(12)\quad \sum_{j\neq i}^{n}\left[\int_{\hat{t}_{ij}}^{\infty}\frac{\partial D_{ij}}{\partial w_i}dt_{ij}+\hat{t}_{ij}\frac{\partial D_{ij}}{\partial w_i}\right]+\sum_{j\neq i}^{n}\left[\int_{\hat{t}_{ji}}^{\infty}\frac{\partial D_{ji}}{\partial w_i}dt_{ji}+\hat{t}_{ji}\frac{\partial D_{ji}}{\partial w_i}\right]$$

$$=\sum_{j\neq k}^{n}\left[\int_{\hat{t}_{kj}}^{\infty}\frac{\partial D_{kj}}{\partial w_k}dt_{kj}+\hat{t}_{kj}\frac{\partial D_{kj}}{\partial w_k}\right]+\sum_{j\neq k}^{n}\left[\int_{\hat{t}_{jk}}^{\infty}\frac{\partial D_{jk}}{\partial w_k}dt_{jk}+\hat{t}_{jk}\frac{\partial D_{jk}}{\partial w_k}\right],\ i\neq k.$$

For comparative purposes with the league profit maximizing outcome, re-write (12) as:

$$(13)\quad \sum_{j\neq i}^{n}\hat{t}_{ij}\frac{\partial D_{ij}}{\partial w_i}-\sum_{j\neq k}^{n}\hat{t}_{kj}\frac{\partial D_{kj}}{\partial w_k}$$

$$=\sum_{j\neq k}^{n}\left[\int_{\hat{t}_{kj}}^{\infty}\frac{\partial D_{kj}}{\partial w_k}dt_{kj}+\int_{\hat{t}_{jk}}^{\infty}\frac{\partial D_{jk}}{\partial w_k}dt_{jk}+\hat{t}_{jk}\frac{\partial D_{jk}}{\partial w_k}\right]$$

$$-\sum_{j\neq i}^{n}\left[\int_{\hat{t}_{ij}}^{\infty}\frac{\partial D_{ij}}{\partial w_i}dt_{ij}+\int_{\hat{t}_{ji}}^{\infty}\frac{\partial D_{ji}}{\partial w_i}dt_{ji}+\hat{t}_{ji}\frac{\partial D_{ji}}{\partial w_i}\right],\ i\neq k.$$

Note that, yet again, we can mimic our earlier Proposition/Corollary approach; the planner distributes talent for a completely balanced league when talent demand is identical across geographical locations, otherwise the planner chooses an unbalanced league but, as we turn to directly without stating any more propositions, a different level of imbalance than occurs at the league equilibrium.

To compare the league equilibrium result and the planner's optimum, we re-write (9) as:

$$(14)\quad \sum_{j\neq i}^{n} t_{ij}^{*}\frac{\partial D_{ij}}{\partial w_i} - \sum_{k\neq j}^{n} t_{kj}^{*}\frac{\partial D_{kj}}{\partial w_k}$$

$$= \sum_{k\neq j}^{n}\left\{ t_{kj}^{*}\left[-\left(\frac{1}{n-1}\right)\frac{\partial D_{kj}}{\partial w_j}\right] + D_{kj}\frac{d\,t_{kj}^{*}}{d\,w_i}\right\}$$

$$- \sum_{j\neq i}^{n}\left\{ t_{ij}^{*}\left[-\left(\frac{1}{n-1}\right)\frac{\partial D_{ij}}{\partial w_j}\right] + D_{ij}\frac{d\,t_{ij}^{*}}{d\,w_i}\right\},\ k\neq j.$$

The answer to our question boils down to the relationship between the right-hand side of (13) and the right-hand side of (14). If the right-hand side of (13) is larger, then the planner distributes talent in a less imbalanced way than occurs in the league equilibrium, that is, the planner prefers less imbalance than the league will produce when:

$$(15)\quad \sum_{j\neq k}^{n}\left[\int_{\hat t_{kj}}^{\infty}\frac{\partial D_{kj}}{\partial w_k}d\,t_{kj} + \int_{\hat t_{jk}}^{\infty}\frac{\partial D_{jk}}{\partial w_k}d\,t_{jk} + \hat t_{jk}\frac{\partial D_{jk}}{\partial w_k}\right]$$

$$- \sum_{j\neq i}^{n}\left[\int_{\hat t_{ij}}^{\infty}\frac{\partial D_{ij}}{\partial w_i}d\,t_{ij} + \int_{\hat t_{ji}}^{\infty}\frac{\partial D_{ji}}{\partial w_i}d\,t_{ji} + \hat t_{ji}\frac{\partial D_{ji}}{\partial w_i}\right]$$

$$> \sum_{k\neq j}^{n}\left\{ t_{kj}^{*}\left[-\left(\frac{1}{n-1}\right)\frac{\partial D_{kj}}{\partial w_j}\right] + D_{kj}\frac{d\,t_{kj}^{*}}{d\,w_i}\right\} - \sum_{j\neq i}^{n}\left\{ t_{ij}^{*}\left[-\left(\frac{1}{n-1}\right)\frac{\partial D_{ij}}{\partial w_j}\right] + D_{ij}\frac{d\,t_{ij}^{*}}{d\,w_i}\right\},$$

$$i\neq k,\ k\neq j.$$

If the right-hand side of (15) is larger, the opposite would be true. This is really a complex comparison, but some insight comes from the two-team league version where (15) becomes:

$$(16)\quad \int_{\hat{t}_{21}}^{\infty}\left(\frac{\partial D_{21}}{\partial w_2}-\frac{\partial D_{21}}{\partial w_1}\right)dt_{21}+\int_{\hat{t}_{12}}^{\infty}\left(\frac{\partial D_{12}}{\partial w_2}-\frac{\partial D_{12}}{\partial w_1}\right)dt_{12}$$

$$+\hat{t}_{12}\frac{\partial D_{12}}{\partial w_2}-\hat{t}_{21}\frac{\partial D_{21}}{\partial w_1}$$

$$>\left[t_{12}^{*}\frac{\partial D_{12}}{\partial w_2}-t_{21}^{*}\frac{\partial D_{21}}{\partial w_2}\right]+\left[D_{21}\frac{dt_{21}^{*}}{dw_1}-D_{12}\frac{dt_{12}^{*}}{dw_1}\right].$$

Now, the right-hand side is less than zero following expression (9). So, while there will be a few cases where the following expression can be negative and still have the planner prefer less imbalance than the league, the planner will always choose less imbalance than the league when:

$$(17)\quad \int_{\hat{t}_{12}}^{\infty}\left(\frac{\partial D_{12}}{\partial w_1}-\frac{\partial D_{12}}{\partial w_2}\right)dt_{12}-\int_{\hat{t}_{21}}^{\infty}\left(\frac{\partial D_{21}}{\partial w_2}-\frac{\partial D_{21}}{\partial w_1}\right)dt_{21}$$

$$<\hat{t}_{21}\frac{\partial D_{21}}{\partial w_1}-\hat{t}_{12}\frac{\partial D_{12}}{\partial w_2}.$$

So we have a comparison between net effects on consumers in the two markets (the left-hand side of (17)) and revenue cross-effects for the two teams (the right-hand side of (17)).

By expression (9), the direct effects dominate and are larger in the larger-revenue market so that the left-hand side of (17) would be positive. Further, on the right-hand side of (17), again since team 1 is the larger-revenue team it should have the higher price for home games, that is $\hat{t}_{12} > \hat{t}_{21}$, by Proposition 4. And we come to the final comparison.

If the indirect effect of team 1's talent choice on home attendance for team 2 is larger than the indirect effect of team 2's talent choice on home attendance for team 1, then $\frac{\partial D_{21}}{\partial w_1} - \frac{\partial D_{12}}{\partial w_2} > 0$. So, if this difference is large enough, then the planner prefers less imbalance than the league will produce. But if the difference between them is small, or indeed if $\frac{\partial D_{21}}{\partial w_1} - \frac{\partial D_{12}}{\partial w_2} < 0$, then the planner would prefer *more imbalance than the league would produce*. Unlike season ticket leagues which are always more imbalanced than the planner's optimum, single-game ticket leagues may be less imbalanced or more imbalanced than the planner's optimum depending on talent choice cross-effects on attendance:

> Proposition 5: In an n-team single-game ticket league, with a competitive talent equilibrium, with invariant ranking of attendance demand, the owner of team i chooses a higher level of quality, and the remaining owners $j \neq i$ a lower level of quality, than the planner's optimum if $\frac{\partial D_{ji}}{\partial w_i} - \frac{\partial D_{ij}}{\partial w_j} > 0$ (large enough); the league has more competitive imbalance than the planner would choose.

> Corollary 5.1: In an n-team single-game ticket league, with a competitive talent equilibrium, with invariant ranking of attendance demand, the owner of team i chooses a lower level of quality, and the remaining owners $j \neq i$ a higher level of quality, than the planner's optimum if $\frac{\partial D_{ji}}{\partial w_i} - \frac{\partial D_{ij}}{\partial w_j} > 0$ (small enough) or $\frac{\partial D_{ji}}{\partial w_i} - \frac{\partial D_{ij}}{\partial w_j} < 0$; the league has less competitive imbalance than the planner would choose.

Before proceeding, let's have a look at what the data tell us about the relationship between $\frac{\partial D_{ji}}{\partial w_i}$ and $\frac{\partial D_{ij}}{\partial w_j}$. While one could analyze the impact on team j's attendance as team i changes quality over time, we investigate the related cross-section version: Do fans in smaller-revenue markets like to watch better teams come to town more than fans in larger-revenue markets like to watch better teams come to town? If so, this is evidence that $\frac{\partial D_{ji}}{\partial w_i} - \frac{\partial D_{ij}}{\partial w_j} > 0$ and, if the difference is large enough, the league equilibrium has more competitive imbalance than the planner would choose.

We examine 1993, the full season just prior to major upheaval in MLB. Following the strike that reduced the number of games in 1994 and 1995, and eliminated the 1994 playoffs and World Series, pooled revenue sharing was introduced in MLB. We also examine what is typically the most competitive division in MLB, the American League (AL) East, as an indicator. A complete assessment of this relationship, across divisions over time, and for other leagues, is the full work of another paper.

In 1993, the Blue Jays finished first and the Brewers finished last. By three different measures of revenue (see the notes in Table 1), New York was the largest-revenue team while Milwaukee was the smallest-revenue team. Boston is the middle revenue club by our three measures. While Boston's revenues are about the average of the AL East, we make the call that Boston is a larger-revenue team for two reasons. First, median revenue in the AL East is well below the average and Boston's revenue is much closer to New York's than it is to Milwaukee's.

The AL East teams are arrayed left to right across the top row of Table 1 according to their revenues. All visiting teams are arrayed from lowest winning percent to highest down the first column of the table. Each column entry shows the change in attendance that occurred as stronger teams visited each of the AL East teams. In 1993, Boston is the only indisputable positive draw when visiting teams in the AL East (check the BOS row in Table 1) and Cleveland comes closest to being the indisputable opposite (check the CLE row in Table 1).

Table 2 shows four comparisons based on the data in Table 1:

- The average change in attendance for AL East teams down the columns of Table 1.
- The average change in attendance for AL East teams aggregated across visitors with winning percents below 0.500 compared to visitors above 0.500.
- The average change in attendance for the top three highest quality visitors.
- The average change in attendance for the two largest attendance increases among the top three highest quality visitors since sometimes there is quite a bit of variation due to such factors as whether the opponent is in the division or not.

The bulk of the evidence in Table 2 shows that smaller-revenue clubs enjoy larger attendance increases than do larger-revenue clubs (and smaller decreases where these occur) as opponent quality increases. At the overall average as opponent quality increases and for just the top three opponents in terms of quality, attendance increases at smaller-revenue clubs are 78% higher than at larger-revenue clubs. At the average of the largest two increases among the top three quality visitors, the result is strongest. Adding the bulk of teams actually generates the observation that attendance increases are smaller when winning teams visit but the decrease is smaller for smaller-revenue clubs. Coupled with the observations about top-quality visitors, this suggests that most of observed effect is being driven by the very top quality visitors.

So, proximate to a time of business upheaval in MLB, fans of smaller-revenue market teams like to see better teams come to town more than fans of larger-revenue market teams like to see better teams come to town. This suggests that $\frac{\partial D_{ji}}{\partial w_i} - \frac{\partial D_{ij}}{\partial w_j} > 0$ and, by Proposition 5, the planner would prefer *less competitive imbalance* than occurs at the league equilibrium. Of course, there are two caveats. First, while the differences appear large, it is a statistical issue for further analysis whether the difference is large enough to satisfy expression (17). Second, whether this is the normal state of affairs for the entire league remains for further analysis. But at least for one important juncture in MLB business history, and for its most competitive division, the situation appears to support the argument that baseball needed to pursue a path to less competitive imbalance if it was to enhance welfare.

IV. Policy Implications

The policy implications are clear from Propositions 1 through 5. Starting from this rudimentary welfare theory foundation (and one empirical observation for a single-game ticket league), what can be said for policy? For the season ticket league is the NFL and for the single-game ticket league we choose MLB.

As mentioned earlier in the paper, the worry is that the NFL may be "too balanced" but this doesn't hold up under our analysis. In terms of competitive imbalance and fan welfare, those arguing for more imbalance have missed the optimality boat. Welfare would require even less imbalance in this already quite balanced league. Of course, arguments for less imbalance may actually veil wealth redistribution motivations. Under some mechanisms in the pursuit of less imbalance, player pay is lower and money does go to smaller-revenue owners. Or the motivation may simply come from a vocal minority of fans of larger-revenue market teams and the disproportionate press coverage they receive.

How might reduced imbalance be accomplished for the NFL? Fort and Quirk (forthcoming) show that for the version of season ticket leagues modeled here, pooled revenue sharing has no impact whatsoever on competitive imbalance. The evidence on the actual behavior of competitive imbalance around the adoption of pooled sharing in the NFL in 2001supports this prediction (Fort, 2006b, p. 176, Table 6.3). Further, the evidence is that the actual application of the NFL payroll spending cap, adopted for the 1992 season, hasn't had much impact on competitive imbalance (Fort 2006b, pp. 194-196). An even harder cap than the NFL chooses to enforce could theoretically reduce imbalance further (Fort and Quirk, 1995). And, of course, a la Coase (1960), the top teams could be rewarded via subsidies or punished via taxes to drive them to choose less talent at the margin.

Turning to MLB, our chosen single-game ticket league, suppose that 1993, analyzed in the last section, is not out of the ordinary; fans in smaller-revenue markets turn out to watch better teams come to town at higher rates than fans in larger-revenue markets. Under this observed behavior, relative to maximizing welfare, MLB has chosen too much competitive imbalance. This is consistent with the views covered in the introduction; pundits clamor for reduced imbalance in baseball. Senate hearings just before the 2001 impositions were put into gear to suggest that MLB get its house in order and Commissioner Selig promised to comply.

So, what mechanisms reduce imbalance in MLB? First, we note that pooled revenue sharing decreases imbalance in our version of the single-game ticket leagues (as also found by Kesenne, 2000 and 2005, under different assumptions). This is easy to see just examining expression (9). The end result is in Proposition 4, namely, owner i chooses more talent than the other owners $j \neq i$. But in getting to equilibrium, under the adding up constraint, owner i wouldn't increase their talent choice nearly as much when the first term in (9) is reduced by revenue sharing (sharing means owner i keeps less of their own revenue) and the second term in (9) rises with revenue sharing (owner i earns a share of what happens to other teams in the league). Pooled revenue sharing in single-game ticket leagues does provide incentives for each team to take into account the effects of its actions on improving the home team revenues at other parks in the league. Larger-revenue owners reduce their talent hiring in a direction consistent with welfare enhancement. Second, it is well-known that the "competitive balance tax" currently in use by MLB will also reduce imbalance if carefully chosen (Fort, 2006b, Chapter 6).

The clear prescription, then, for what MLB already is choosing to do, is to increase pooled revenue sharing in a meaningful way and to raise its competitive balance tax. Interestingly, Fort (2006b, p. 176, Table 6.3) shows that imbalance increased after MLB first introduced pooled sharing in 1996 and worsened again after pooled sharing was extended and the competitive balance tax was imposed in 2001 (much worse in the AL than in the NL in each episode). While the tools, theoretically, *can* reduce imbalance, their actual imposition failed to do so. The operative word in our prescription, then, is *meaningful increases* in sharing and the competitive balance tax. Again, a la Coase, the top teams could be paid to choose less talent as well.

However, it should be clear from the foregoing that owners in NALs cannot be expected to violate their profit maximizing choices. If the NFL has chosen its revenue sharing and payroll spending cap in order to maximize league profits, some other form of intervention would be needed in order to enhance welfare by reducing imbalance even further. And the same goes for MLB and its revenue sharing and competitive balance tax choices. This means that some sort of external intervention would need to be imposed in order to move decentralized league decision making toward the planner's optimum. The type of "mechanism-oriented" intervention suggested here however currently lacks any regulatory agency to carry it out.

That does leave one final policy action with much to recommend it since one type of intervention structure does exist under the antitrust laws. In particular for sports, Fort (forthcoming) lists the references in the argument over practical, case-by-case intrusions into sports. Some argue that more intrusive action by the Federal Trade Commission and the Department of Justice would enhance efficiency. Others counter either that pro sports is an application that the laws were not intended to cover and forced applications could be harmful, or that the efficiency gains may be offset by well-known government proclivities from the public choice literature. Still others argue that league restrictions on team movements and other team activities enhance efficiency (fan welfare) relative to the absence of these restrictions.

Once again, none of this discussion makes any appeal to an optimal level of competitive imbalance. But there is one long-standing antitrust prescription for competitive imbalance in NALs that is more general in its approach, namely, breaking up the leagues into smaller, competing major leagues (originally, Horowitz, 1976; Noll, 1976; Ross, 1989, 1991; a fuller list of references is in Quirk and Fort, 1999). If two competing leagues were created from an existing league, proponents argue that the result would unleash competitive forces so that a team would exist in every economically viable location. If the result approaches the competitive distribution of teams, Pareto optimality would reign with the sum of producers' and consumers' surpluses maximized.

This would be the planner's outcome with optimal competitive imbalance detailed in this paper. Competition would distribute teams so that any remaining smaller- and larger-revenue potential among the franchises would approximate the optimal distribution of winning percent in the planner's outcomes in (9) for the season ticket league and (14) for the single-game ticket league. And to not put too fine a point on it, there already is both a legal structure and historical precedence for this type of antitrust intervention.

Our final policy note is actually one of caution. Without knowledge of the relationships in (9) for season ticket leagues, or in (14) for single-game ticket leagues, the effective application of pooled revenue sharing, taxes, or subsidies by some yet to be devised intervening agency cannot be done; what level of revenue sharing, subsidy, or tax should be chosen? Only a complete analysis of the impact of changes in quality on *all demand functions* can specify the magnitude of the corrections to league choices that move toward the welfare maximizing level of competitive imbalance.

In essence, estimates of the impact of changes in quality actually measure the empirical importance of Rottenberg's uncertainty of outcome hypothesis; how does attendance respond to increases in the quality of opponents. Estimates of those impacts, to date have been somewhat clumsy but are evolving (reviewed in Fort, 2006a). The analysis here suggests that these estimates are required *before* the correct application to competitive imbalance remedies can be determined.

To conclude our look at policy, we are not so naïve as to believe that only efficiency matters in the policy process. Indeed, public choice analysis often reveals that it matters very little. Every move away from any league's profit maximizing choice will have distributional consequences on players, owners, and fans. Indeed, leagues have a variety of mechanisms for attaining their own ends and the ones chosen and favored by leagues must have favorable distributional consequences for them. But identifying the optimal level of competitive imbalance is important because doing so sets the stage for the analysis of the distributional consequences relative to welfare maximization; it is possible to know the cost in terms of fan welfare of violating the planner's optimum.

At the Senate hearing cited earlier in the paper, syndicated columnist and advisor to MLB George F. Will stated flatly, "Baseball is not Bangladesh. It can get well by deciding to get well." And it is true that many fans already enjoy great satisfaction from their teams and many teams are economically successful. But there are welfare improvements to be had. And the work here suggests how to approach the enhancement of welfare.

V. Conclusions and Suggestions for Further Research

We seek to remedy the complete absence of considerations of the optimal level of competitive imbalance in North American sports leagues by devising a planner's optimum that maximizes the sum of producers' and consumers' surpluses. That outcome is compared to decentralized, profit-maximizing outcomes for two types of leagues, one where season ticket sales dominate team revenues (like in the NFL) and another where single-game ticket sales determine revenue (like in MLB).

Complete competitive balance is extremely unlikely for either type of league; the optimal level of imbalance is nearly never zero. And in season ticket leagues, the most reasonable outcome is a league with more than the social planner's optimum level of competitive imbalance. Things are not so straightforward in single-game ticket leagues. Whether the league has too much imbalance or too little rests entirely on attendance cross-effects related to owner talent choices. However, cursory evidence suggests that this type of league also is choosing more imbalance than the planner's optimum.

For policy implications, given our results on actual versus optimal outcomes, it is possible to identify how different mechanisms (pooled revenue sharing, payroll spending caps, subsidy or tax incentives, and antitrust action) can be used to reduce imbalance. However, we do not expect that owners will choose the optimal level themselves since that would violate profit maximization. Currently, there is no external structure governing NALs that could impose the planner's optimum using the different mechanisms listed in the paper. But the antitrust remedy of breaking up the leagues does already have the requisite legal structure and precedence. In addition, careful estimates of impacts of talent choice on attendance demand for all teams are required in order to choose intervention mechanisms that effectively hit the optimal level of competitive imbalance.

There are many avenues for future work suggested by this analysis. We utilize the competitive talent market model most applicable to NALs. But Szymanski (2004) suggests that other leagues around the world may be better treated with non-cooperative models. And extensions beyond gate demand will no doubt prove insightful. For that matter, different owner objectives would produce different decentralized league outcomes for comparison to the planner's optimum (most recently, Fort and Quirk, 2004; Kesenne, 2005).

Our results also provide two empirically testable results. First, on the way to Proposition 4, the model suggests marginal consumers' surpluses in smaller-revenue markets will be larger than in larger-revenue markets. The analysis of fan surpluses ranked by market revenue potential could be used to test the veracity of this analysis. Second, the examination of which fans turn out in greater numbers as stronger visitors come to town, smaller- or larger-revenue market fans, received only cursory treatment in this paper. Space constraints and our own limitations leave these additional fruitful avenues of analysis for others.

References

Canes, M.E. 1974. "The Social Benefits of Restrictions on Team Quality." In R.G. Noll (ed.) *Government and the Sports Business* (Washington, D.C.: Brookings Institution).

Coase, R. 1960. "The Problem of Social Cost." *Journal of Law and Economics* 3:1-44.

El-Hodiri, M., and Quirk, J. 1971. "An Economic Model of a Professional Sports League." *Journal of Political Economy* 70:1302-1319.

Fort, R. 2006a. "Competitive Balance in North American Professional Sports." In J. Fizel (ed.) *Handbook of Sports Economics Research* (Armonk, N.Y.: M.E. Sharpe).

Fort, R. 2006b. *Sports Economics 2d. E.* (Upper Saddle River, NJ: Prentice Hall).

Fort, R. Forthcoming. "Sports Leagues and the Antitrust Laws." In V.J. Tremblay and C.H. Tremblay (eds.) *Industry and Firm Studies* (Armonk, N.Y.: M.E. Sharpe, Inc.).

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

Fort, R., and Quirk, J. 2004. "Owner Objectives and Competitive Balance." *Journal of Sports Economics* 5:30-42.

Fort, R., and Quirk, J. Forthcoming. "The Competitive Talent Market Model: Rational Expectations in Pro Sports Leagues." *Scottish Journal of Political Economy.*

Heilmann, R.L., and Wendling, W.R. 1976. "A Note on Optimum Pricing Strategies for Sports Events." In R.E. Machol, S.P. Ladany, and D.G. Morrison (eds.) *Management Science in Sports* (Amsterdam: North-Holland Publishing Company).

Horowitz, I. 1976. Testimony on *Inquiry into Professional Sports*, Select Committee on Professional Sports, House of Representatives, 94th Congress, 2d Session, part 2, September, pp. 131-136.

Kesenne, S. 2000. "Revenue Sharing and Competitive Balance in Professional Team Sports." *Journal of Sports Economics* 1:56-65

Kesenne, S. 2005. "Revenue Sharing and Competitive Balance: Does the Invariance Proposition Hold?" *Journal of Sports Economics* 5:98-106.

Marburger, D.R. 1997. "Gate Revenue Sharing and Luxury Taxes in Professional Sports." *Contemporary Economic Policy* XV:114-123.

Modigliani, F. 1977. "The Monetarist Controversy or, Should We Forsake Stabilization Policies?" *American Economic Review* 67:1-19.

Neale, W.C. 1964. "The Peculiar Economics of Professional Sports." *Quarterly Journal of Economics* 78:1-14.

Noll, R.G. 1976. Testimony on *Inquiry into Professional Sports*, Select Committee on Professional Sports, House of Representatives, 94th Congress, 2d Session, part 2, September, pp. 131-136.

Pedulla, T. 2003. "NFL Dynasties Go 'Way of the Dinosaurs.'" *USAToday.com*, January 23; gleaned October 9, 2006 (http://www.usatoday.com/sports/football/super/2003-01-23-1acover-dynasties_x.htm).

Quirk, J., and Fort, R. 1999. *Hard Ball: The Uses and Abuses of Market Power in Professional Sports* (Princeton, NJ: Princeton University Press).

Rottenberg, S. 1956. "The Baseball Players' Labor Market." *Journal of Political Economy* 64:242-258.

Szymanski, S. 2003. "The Economic Design of Sporting Contests." *Journal of Economic Literature* XLI:1137-1187.

Szymanski, S. 2004. "Professional Team Sports Are Only a Game: The Walrasian Fixed-Supply Conjecture Model, Contest-Nash Equilibrium, and the Invariance Principle." *Journal of Sports Economics* 5:111-126.

Team Marketing Report. 2006. "TMR's Fan Cost Index." Gleaned October 12; http://www.teammarketing.com/fci.cfm

U.S. Senate, 2001. *Baseball's Revenue Gap : Pennant for Sale? Hearing before the Subcommittee on Antitrust, Business Rights, and Competition of the Committee on the Judiciary*, United States Senate, 106th Congress, 2nd Session, November 21, 2000.

Vass, G. 2000. "Competitive Balance: Still Only a Dream in the Majors." *Baseball Digest*, May.

Vrooman, J. 1996. "The Baseball Players' Labor Market Reconsidered." *Southern Economic Journal* 63:339-360.

Table 1. Summary Ranking, AL East 1993.

		MIL	CLE	DET	BOS	BAL	TOR	NY
Visitor	W%	7,7,7	6,6,5	5,5,6	3,4,4	4,3,2	2,2,1	1,1,3
MIL	0.426	-	-3,487	-9,588	-4,343	386	19	-5,745
CAL/MIN	0.438	8,762	-737	-582	3,315	-773	-214	6,331
CLE	0.469	-3,410	-	709	-1,793	-923	-324	-5,945
BOS	0.494	1,734	6,377	5,566	-	1,650	559	17,477
SEA	0.506	-5,172	3,714	-12,227	252	-14	-3,336	-14,718
KC	0.519	-1,081	-10,793	10,617	-1,644	-391	2,857	9,284
BAL/DET	0.525	6,052	9,162	-3,663	2,205	604	465	-3,417
TEX	0.531	-3,177	-1,616	-1,580	1,782	95	-767	755
NY	0.543	-583	9,915	6,081	2,537	-514	778	-
CHI	0.580	12,283	8,965	-5,995	-1,974	-3,878	-23	-4,686
TOR	0.586	-2,278	-22,266	13,228	-2,664	4,092	-	13,157

Oakland is the baseline, 0.420 winning percent. Rank order triplet (across the top) is *Forbes* gate plus stadium revenues, *Forbes* total revenues, and revenues calculated multiplying Team Marketing Report's fan cost index by attendance divided by four; example: New York with 1,1,1 was first for all three revenue definitions while Milwaukee with 7,7,7 was last for all three definitions. All attendance data, by opponent (down the columns), are from the Retrosheet Official Webpage (retrosheet.org); heading "Game Logs."

Table 2. Average Attendance Increases with Opponent Quality, Smaller-Revenue v. Larger-Revenue Teams, AL East 1993.

	Smaller-Rev	Larger-Rev
Overall Average		
Smaller-Revenue	512	
Larger-Revenue	288	
% Difference	77.9%	
< 0.500 to > 0.500		
	Smaller-Rev	Larger-Rev
< 0.500	702	546
> 0.500	456	32
% Difference	-35.0%	-94.1%
Top 3		
Smaller-Revenue	512	
Larger-Revenue	288	
% Difference	77.9%	
Top 2/3		
Smaller-Revenue	8,315	
Larger-Revenue	1,671	
% Difference	397.6%	

From Table 1, Milwaukee, Cleveland, and Detroit are smaller-revenue teams while Boston, Baltimore, Toronto, and New York are larger-revenue teams.